

**DRAFT FOR AGENCY REVIEW**

**COMBINED EFFECTIVENESS MONITORING WORK PLAN**

**HARTFORD PETROLEUM RELEASE SITE**

**HARTFORD, ILLINOIS**

October 7, 2016

**APEX OIL COMPANY, INC.**

8235 Forsyth Boulevard

St. Louis, Missouri 63105

**212 ENVIRONMENTAL CONSULTING, LLC**

816 Delta Avenue

Cincinnati, Ohio 45226





# TABLE OF CONTENTS

## INTRODUCTION..... 1-1

1.1.	BACKGROUND	1-2
1.1.1.	HYDROGEOLOGIC SETTING	1-2
1.1.2.	INTERIM MEASURES	1-4
1.1.2.1.	LNAPL SKIMMING	1-4
1.1.2.2.	SOIL VAPOR EXTRACTION	1-5
1.1.3.	VAPOR INTRUSION PATHWAY	1-5
1.2.	PURPOSE	1-8
1.3.	WORK PLAN ORGANIZATION	1-9

## CURRENT IN-HOME AND EFFECTIVENESS MONITORING..... 2-1

2.1.	WEEKLY IN-HOME MONITORING	2-1
2.2.	QUARTERLY IN-HOME MONITORING	2-1
2.3.	RIVER STAGE TRIGGERED MONITORING	2-2
2.4.	QUARTERLY EFFECTIVENESS MONITORING	2-2
2.4.1.	Vapor Monitoring Probes	2-3
2.4.2.	Multipurpose Monitoring Points	2-3
2.4.3.	Groundwater Monitoring Wells	2-4
2.5.	MONITORING PROCEDURES	2-4
2.5.1.	In-Home Monitoring Procedures	2-4
2.5.2.	Effectiveness Monitoring Procedures	2-5
2.5.3.	Pneumatic Testing to Evaluate Integrity and Soil Vapor Permeability	2-6
2.6.	DATA EVALUATION AND REPORTING	2-6

## PROPOSED COMBINED EFFECTIVENESS MONITORING..... 3-1

3.1.	EFFECTIVENESS MONITORING	3-3
3.1.1.	Monitoring Procedures	3-5
3.1.2.	Frequency of Monitoring	3-6
3.1.3.	Data Validation	3-6
3.1.4.	Data Reduction and Reporting	3-8

---



## TABLE OF CONTENTS (CONTINUED)

<b>3.2.</b>	<b>PASSIVE IN-HOME MONITORING</b>	<b>3-8</b>
3.2.1.	Passive Sample Collection and Analysis	3-9
3.2.2.	Data Validation	3-10
3.2.3.	Data Reduction and Reporting	3-11
3.2.4.	Baseline Study	3-13
3.2.4.1.	Field Screening	3-14
3.2.4.2.	Collection of Samples using Summa Canisters	3-14
3.2.4.3.	Collection of Passive Samples	3-15
3.2.4.4.	Evaluation of Acute Risks	3-15
3.2.4.5.	Data Evaluation and Reporting	3-16
<b>3.3.</b>	<b>RIVER STAGE TRIGGERED MONITORING</b>	<b>3-16</b>
3.3.1.	Recent Event Summary	3-17
3.3.2.	Revised River Stage Trigger Criteria	3-19
3.3.3.	Revised River Stage Monitoring Program	3-19
<b>3.4.</b>	<b>MITIGATION MEASURES INSPECTION AND MAINTENANCE ACTIVITIES</b>	<b>3-21</b>
	<b>NOTIFICATION AND CONTIGENCY MEASURES</b>	<b>4-1</b>
	<b>REFERENCES</b>	<b>5-1</b>



## FIGURES LIST

1. Site Location
  2. Petroleum Recovered Since 1978
  3. Hartford Vapor Collection System Layout
  4. Current In-Home and Effectiveness Monitoring Networks
  5. Proposed Effectiveness Monitoring Network
  6. Total Volatile Petroleum Hydrocarbon versus Oxygen Concentration Outlier Summary  
(Second Quarter 2015 – Third Quarter 2016)
  7. River Stage Triggered Event Summary (December 2012 – September 2016)
-



## TABLES LIST

1. Interim In-Home Monitoring Network
  2. Current Effectiveness Monitoring Network
  3. Proposed Effectiveness Monitoring Network
  4. Monitoring Locations with 10-feet or More of Exposed Screen
  5. Monitoring Locations with Elevated Concentrations of Total Volatile Petroleum Hydrocarbons and Oxygen
  6. Stakeholder Contact Information
-



## APPENDICES LIST

- A. Quarterly Effectiveness Monitoring Results Summary (Second Quarter 2015 – Third Quarter 2016)
- B. Mississippi River Stage Summary (2004-2016)



## SECTION 1.0 INTRODUCTION

Apex Oil Company, Inc. (Apex) is performing operations, monitoring, and maintenance (OMM) of the soil vapor extraction (SVE) system beneath the northern portions of the Village of Hartford, Illinois, also referred to as the Hartford Petroleum Release Site (Hartford Site). The SVE system includes the vapor collection system components located in the Village of Hartford and the thermal treatment system components located on the Premcor facility, east of the Village of Hartford. OMM of the SVE system is being conducted pursuant to the July 28, 2008 Order (Docket Number 05-CV-242-DRH) issued by United States District Judge David Herndon, as well as correspondence dated September 18, 2014 from the United States Environmental Protection Agency (USEPA) "reassigning work" at the Hartford Site from the Hartford Working Group (a consortium of oil companies including Premcor, Shell Oil, British Petroleum, and Sinclair Oil Corporation) to Apex.

Apex assumed OMM of the vapor collection system components in April 2015 and operation of the thermal treatment system in June 2015. Monitoring of the SVE system is conducted by Apex in general accordance with numerous work plans developed iteratively over the past decade including:

- OMM of the thermal treatment system is performed in accordance with the *VCS Operations and Maintenance Manual, Hartford Working Group* (URS 2014a)
  - Monitoring performed within the extraction wells and other vapor collection system components installed in the Village of Hartford is conducted in accordance with the final *Vapor Collection System Operation, Maintenance, and Monitoring Plan, Hartford Petroleum Release Site, Hartford, Illinois (VCS OMM Plan, Trihydro 2015a)* dated September 4, 2015
  - Regional effectiveness monitoring, which includes quarterly screening within selected soil vapor monitoring probes and multipurpose monitoring points is performed in accordance with the *Effectiveness Monitoring Plan, Hartford Hydrocarbon Plume Site, Hartford, Illinois (Effectiveness Monitoring Plan, URS 2014c)*
  - In-home monitoring, including weekly and quarterly screening of indoor air and sub-slab soil vapor within select homes across the Hartford Site, is performed in accordance with the final *Interim In-Home Effectiveness Monitoring Plan, Hartford Petroleum Release Site, Hartford, Illinois (Interim In-Home Effectiveness Monitoring Plan, Trihydro 2014a)*
  - River stage triggered monitoring of indoor air and sub-slab soil vapor within select homes is performed in accordance with the triggers and methods described in the final *Interim In-Home*
-

*Effectiveness Monitoring Plan (Trihydro 2014a), as well as the System Operation and Maintenance Response to River Rise, Groundwater Related and Sub-slab Triggers, Hartford Area Hydrocarbon Plume Site (URS 2014b)*

## **1.1. BACKGROUND**

The Village of Hartford is located in Madison County, Illinois on the east bank of the Mississippi River, approximately twelve miles northeast of St. Louis, Missouri. Three refineries were constructed adjacent to the northern portion of the Village of Hartford between 1907 and 1941, the Amoco Oil Refinery (currently British Petroleum facility), the Clark Oil Refinery (currently the Premcor facility), and the Shell Oil Refinery (currently the ConocoPhillips facility). In addition, a bulk petroleum storage facility was constructed north of the Village of Hartford (currently the Hartford Wood River Terminal Oil Company facility). Refining, storage, and transport of petroleum hydrocarbons continues to be conducted adjacent to the Village of Hartford associated with portions of these refineries and terminal operations. In addition, numerous underground and aboveground petroleum pipelines connect the refineries and terminal to loading and unloading facilities on the Mississippi River. Figure 1 shows the location of the Hartford Site and adjacent facilities. Numerous releases of petroleum hydrocarbons, hereafter referred to as LNAPL, have been documented within or immediately adjacent to the northern portions of the Village of Hartford.

### **1.1.1. HYDROGEOLOGIC SETTING**

The Hartford Site is located along the historical edges of the Mississippi and Missouri River flood plains within a shallow valley approximately 30 miles long and 11 miles across at its widest point, and underlain by more than 100 feet of unconsolidated deposits created by alluvial and glacial processes during the Pleistocene period. Over the last 125,000 years, the Mississippi River has changed its course frequently resulting in deposition of sediments with widely-varying grain size across a broad area creating a highly heterogeneous unconsolidated stratigraphy (USEPA 2010). As a result, the lithology beneath the Hartford Site consists of alternating alluvial deposits of clay and silt overlying a regionally extensive sand deposit referred to as the Main Sand stratum. The Main Sand stratum consists of alluvial sands and coarse grained glacial outwash that ranges from 80 to 100 feet in thickness. The alluvial deposits overlying the Main Sand, while interbedded and generally discontinuous, have been described by others in terms of a simplified stratigraphic sequence. The more permeable units have been identified (in descending order with respect to depth) as the North Olive, the Rand, and the EPA hydrostratigraphic units. These permeable zones are bounded by

discontinuous clay deposits that have been labeled (in descending order with respect to depth) as the A, B, C, and D Clay.

The A Clay is continuously present beneath the Hartford Site, with the exception of areas where it has been removed as part of construction activities. The B and C Clay are highly discontinuous and of limited aerial extent. The B and C Clay define the extent of the North Olive and Rand hydrostratigraphic units, respectively. The North Olive and Rand strata laterally grade into and are hydraulically connected with the Main Sand (and Main Silt where present under the western and southwestern portions of the Hartford Site), where the B and C Clay are absent. Groundwater within the North Olive and Rand strata generally occurs as isolated areas of perched water on the surface of the underlying clay.

The D Clay underlies and defines the limits of the EPA stratum. The D Clay could be considered a discontinuous lens within the Main Sand stratum based on its relative thickness (thickness between approximately 2 to 7 feet) and limited extent (only present in the northeastern portion of the Hartford Site). The EPA stratum grades laterally into the Main Sand to the south of a southwesterly trending line extending from the intersection of Old St. Louis Road and North Delmar Avenue to just north of the intersection of East Date Street and North Olive Street. Along this boundary, the EPA and Main Sand strata are hydraulically connected with flow in the EPA stratum towards the southwest.

Groundwater present in the Main Sand stratum is part of an extensive aquifer system commonly referred to as the American Bottoms aquifer. The natural groundwater flow regime in the Main Sand stratum has been altered beneath the Hartford Site due to pumping on the British Petroleum (approximately 1,225 gallons per minute), Phillips66 (more than 6,000 gallons per minute along the river dock and 3,000 gallons per minute on the refinery), and Premcor (approximately 300 gallons per minute) facilities. The groundwater flow direction in the Main Sand is also influenced by the stage of the Mississippi River. During periods of high river stage, which are defined by periods when the river stage exceeds 410 feet above mean sea level (ft-amsl, greater than the 75th percentile of all river stage measurements collected between 2004 and 2015), groundwater flow is generally towards the east to northeast due to recharge from the river and bank storage within the Main Sand. During moderate river elevations, the groundwater flow direction is northward. During low river stages, which are defined by periods when the river elevation is less than 400 ft-amsl (less than the 25th percentile of all river stage measurements collected between 2004 and 2015), groundwater flow trends northwesterly to westerly.

The Mississippi River is located less than a half mile from the Hartford Site and is hydraulically connected to the two deeper hydrostratigraphic units (EPA and Main Sand), and on occasion during very high river stages, the groundwater surface in the Main Silt and Main Sand can reach the Rand stratum. Water level fluctuations in the EPA stratum and Main Sand correspond to changes in the Mississippi River stage. Since the river stage varies by more than 20 feet during a year, the groundwater conditions can fluctuate from unconfined to confined conditions.

### **1.1.2. INTERIM MEASURES**

Interim measures were implemented at the Hartford Site beginning in 1978, and have primarily consisted of LNAPL skimming and soil vapor extraction (SVE). As of 2015, approximately 3.2 million gallons of LNAPL had been recovered with 1.3 million gallons removed via skimming (USEPA 2010, RAM 2013) and an additional 1.9 million gallons as vapor from operation of the SVE system (Illinois EPA 2004, Trihydro 2015b). Figure 2 shows the volume of hydrocarbons recovered via skimming and SVE since 1978.

#### **1.1.2.1. LNAPL SKIMMING**

In 1978 and 1979, Clark Oil installed two large diameter groundwater production wells (RW-001 and RW-002) at the Hartford Site for the purpose of skimming LNAPL from the Main Sand stratum. Between 1978 and 1990, LNAPL skimming was performed within these two production wells, with the exception of a period between 1983 and 1984 when operations were temporarily ceased. Approximately 1,162,000 gallons of LNAPL were recovered from these two wells through 1990. Recovery rates of LNAPL during skimming ranged from approximately 1,000 to 29,000 gallons per month (USEPA 2010). It should be noted that skimming was discontinued in 1984 but resumed between 1985 and 1990, although detailed LNAPL recovery records are not available, the total volume removed over that timeframe was reportedly more than 400,000 gallons (USEPA 2010). There are no available records of skimming being performed in the production wells between 1991 and 1993. However, a third production well (RW-003) was installed by Premcor in 1993. From January 1994 through September 2002, Premcor reportedly recovered 82,700 gallons of LNAPL from the three production wells (USEPA 2010). Between late 2002 and 2004 skimming does not appear to have been conducted within the production wells installed in the Village of Hartford.

Beginning in 2004, the Hartford Working Group began managing interim measures and installed three additional production wells (RW-004, RW-004A, and RW-005), as depicted on Figure 1. Approximately 18,000 gallons of LNAPL were recovered via skimming activities within the Main Sand

stratum between 2004 and 2009. During this time, the Hartford Working Group also conducted several pilot tests to evaluate potential remedial technologies including multiphase extraction and dual phase extraction. An additional 12,000 gallons of LNAPL were recovered as part of pilot testing these two remedial technologies.

In March 2009, routine OMM of the interim measures at the Hartford Site were transferred to Apex. Apex conducted LNAPL skimming at two of the recovery wells (RW-002 and RW-004A) through December 2010 and recovered 15,000 gallons of LNAPL. In addition, Apex conducted LNAPL skimming within the groundwater and multipurpose monitoring network beginning in 2009 and recovered an additional 25,000 gallons of LNAPL through the end of 2012.

### **1.1.2.2. SOIL VAPOR EXTRACTION**

An SVE system was installed and operated by Clark Oil & Refining Corporation (now Premcor) in 1992 and consisted of 12 vapor control boreholes, two blowers, and a single thermal treatment oxidizer. Beginning in 2005, the Hartford Working Group replaced the original SVE system in three phases. The current SVE system consists of a network of approximately 118 vapor extraction wells connected through a series of piping and valves to a single 12-inch pipe (referred to as the Main Header) that extends to the east beneath the railroad right-of-way to a series of four thermal oxidizers located on the Premcor Facility. Figure 3 shows the general location of the SVE extraction wells and piping, as well as the SVE Effectiveness Zones (Zones 1 through 6) established for the purpose of evaluating the system performance.

As shown on Figure 2, approximately 930,000 equivalent gallons of volatile petroleum hydrocarbons were recovered via the initial SVE system between 1992 and 2004. Approximately 1,000,000 equivalent gallons of volatile petroleum hydrocarbons have been recovered via the current SVE system between May 2005 and December 2015. Vapor recovery has not reached asymptotic conditions, as the highest daily recovery occurred in late 2012 due to sustained low groundwater elevations over several months and focused efforts to remove vapors during these temporary low water table conditions.

### **1.1.3. VAPOR INTRUSION PATHWAY**

The first reported instance of the vapor intrusion pathway being complete within a structure located at the Hartford Site appears to have occurred in May 1966, in the form of an odor complaint from a resident to the Hartford Police and Fire Departments. Since this first instance, there have been more

than 360 odor complaints and 26 "fires" reported in structures (USEPA 2010). The following is a summary of the frequency of odor complaints that have been associated with intrusion of volatile petroleum related constituents into structures at the Hartford Site by decade (USEPA 2010):

- 1960s - 7 odor complaints
- 1970s - 245 odor complaints
- 1980s - 20 odor complaints
- 1990s - 77 odor complaints
- 2000s - 14 odor complaints
- 2010s - 0 odor complaint

It should be noted that "fires" reported in structures typically consisted of a small flame present immediately along the basement walls. There is no evidence that there were any structural or content losses associated with a complete vapor intrusion pathway into a structure at the Hartford Site.

In response to the vapor intrusion pathway being complete, a SVE system was installed in 1992 after which there was a significant reduction in odor complaints. The SVE system was replaced in 2005 by the Hartford Working Group, as discussed in Section 1.1.2.2. Additionally, beginning in 2004, a number of in-home mitigation activities were also performed by the Hartford Working Group including:

- Sealing cracks in basement walls and floors
- Installing a barrier to seal exposed soil surfaces within building footprints including crawlspaces (referred to as flowable fill)
- Sealing or fixing sewer drains within structures that could be a pathway for vapor migration
- Sealing openings where utilities enter structures
- Installing ventilation fans, carbon monoxide detectors, and combustible gas monitors in selected structures where a completed pathway was documented
- Installing air purifying systems in selected structures where a completed pathway was documented
- Installing sub-slab depressurization systems in selected structures where a completed pathway was documented

That same year, routine indoor air and sub-slab monitoring began within the structures at the Hartford Site to evaluate the vapor intrusion pathway. Initially, monitoring included collection of indoor air and soil vapor samples for laboratory analysis of volatile petroleum related constituents. Over time, in-home monitoring transitioned to field screening of total volatile petroleum hydrocarbons in indoor air and sub-slab soil vapor, as described in Section 2.5. The results of the in-home monitoring program indicated that the vapor intrusion pathway was periodically complete within select structures at the Hartford Site, this typically occurred following a rapid increase in the Mississippi River stage (referred to as a river stage triggered event).

The vapor collection system components have been continuously modified and optimized over the past decade, primarily through the installation of additional extraction wells, in addition to changes in the methodology used to recover vapor and groundwater within individual extraction wells (e.g., installation of a straw stinger). The vapor collection system was last expanded in early 2015 with the installation of six extraction wells along West Birch and West Arbor Streets (within SVE Effectiveness Zone 1). There has not been a completed vapor intrusion pathway into any of the structures at the Hartford Site, including during river stage triggered events (further described in Section 3.3) since June 2014<sup>1</sup>, prior to the most recent expansion of the SVE system. The absence of a completed vapor intrusion pathway has been attributed to operation of the SVE system and natural smear zone depletion processes which have reduced the mass of LNAPL and volatile petroleum hydrocarbon concentrations in soil vapor and groundwater within the shallow portions of the subsurface (Trihydro 2014b, 212 Environmental 2016a).

---

<sup>1</sup> It should be noted that on August 26, 2015, during the quarterly in-home monitoring event, total volatile petroleum hydrocarbon concentrations measured within one of the sub-slab probes installed at 101 E Birch exceeded 350 ppmv and indoor air concentrations exceeded 10 ppmv, which are considered the action levels for additional monitoring, as described in the final *Interim In-Home Effectiveness Monitoring Plan* (Trihydro 2014a). The USEPA and Illinois EPA were notified via email that day and it was determined that additional monitoring including the collection of samples for laboratory analysis was not necessary since the structure was vacant. Extraction well HSVE-099, located adjacent to this structure in SVE Effectiveness Zone 6, was temporarily shut-down during high water table conditions within this extraction well, which is screened in the North Olive stratum. The elevated concentrations measured beneath the slab and inside 101 E Birch were recorded following a rapid decrease in the Mississippi River stage and groundwater elevations, as shown on Figure 7. Extraction well HSVE-099 was restarted on August 26, 2015. The sub-slab and indoor air concentrations were subsequently measured below the action levels within and below 101 E Birch on August 27, 2016. There were no other instances where the concentration of total volatile petroleum hydrocarbons within indoor air and/or sub-slab soil vapor exceeded the notification or action levels at the Hartford Site since June 2014.

## 1.2. PURPOSE

The primary objective of this combined effectiveness monitoring work plan is to reexamine the lines of evidence used to evaluate completeness of the vapor intrusion pathway within structures located at the Hartford Site, including times immediately following a rapid increase in the Mississippi River stage. Currently, data collection has been focused on screening volatile petroleum hydrocarbons within structures and comparing the measured concentrations to action levels (10 parts per million in indoor air and 350 parts per million in sub-slab soil vapor) to demonstrate that there are not potential risks for receptors. Additionally, screening of soil vapor samples collected from the nested multipurpose monitoring points and vapor monitoring probes has been performed quarterly to evaluate the performance of the SVE system in mitigating the vapor intrusion pathway and recovering volatile petroleum hydrocarbons (Trihydro 2015b, 212 Environmental 2016b). The current lines of evidence were developed when the vapor intrusion pathway was complete beneath many structures and a significant light non-aqueous phase liquids (LNAPL) source was present in the shallow stratum (e.g., North Olive stratum) beneath the Hartford Site. In light of changes in the LNAPL source within the shallow subsurface (Trihydro 2014b, 212 Environmental 2016a) and an incomplete pathway for petroleum related constituents since June 2014 (Trihydro 2015b, 212 Environmental 2016b), Apex is proposing that future monitoring of the vapor intrusion pathway be altered to focus on the following:

1. Routinely measuring fixed gas (oxygen, carbon dioxide, and methane) and total volatile petroleum hydrocarbon concentrations in soil vapor collected from the nested vapor monitoring points, vapor monitoring probes, and groundwater monitoring wells screened in the shallow portions of the subsurface (including the A-Clay and North Olive stratum). Monitoring locations will be selected that are appropriately constructed, similarly screened, and representative of subsurface conditions beneath structures (i.e., depth of the screen generally correlates to shallow depths beneath basements). The influence of nearby extraction wells will be considered when evaluating the soil vapor screening results and consider the migration pathway for volatile petroleum hydrocarbons in the subsurface.
2. Collecting passive, time-weighted samples in indoor air, outdoor air, and soil vapor from selected structures (on a rotational basis) for laboratory analysis of petroleum related constituents for evaluation of the vapor intrusion pathway, as well as comparison to risk-based screening levels (e.g., USEPA Vapor Intrusion Screening Levels). Passive samples will be collected over extended timeframes to evaluate time-weighted concentrations of volatile constituents for assessing inhalation risks to receptors over a range of seasonal and hydraulic conditions. Collecting passive samples over extended timeframes allows for a more accurate means of assessing

inhalation risk rather than biasing sample collection during worst case conditions (e.g., river stage triggered events), as typically performed via collection of grab samples from sub-slab soil vapor or indoor air.

Initially, studies will be performed and data will be collected from within and outside of the structures to correlate the previous lines of evidence to the results obtained using these two proposed methods. This will include periods during a river stage triggered event. In-home monitoring as described within the final *Interim In-Home Effectiveness Monitoring Plan* (Trihydro 2014a) and effectiveness monitoring of the SVE system as described within the *Effectiveness Monitoring Plan* (URS 2014c) would be discontinued after these initial studies and monitoring events have been conducted and the proposed methods are shown to be effective at evaluating the vapor intrusion pathway and potential inhalation risks at the Hartford Site.

### **1.3. WORK PLAN ORGANIZATION**

The remainder of this work plan is organized into the following sections:

- Section 2.0 – includes a summary of the current in-home and effectiveness monitoring programs, including a description of river stage triggered monitoring
- Section 3.0 – summarizes the proposed revisions to in-home and effectiveness monitoring programs at the Hartford Site, including revisions to the river stage trigger criteria and monitoring program
- Section 4.0 – describes additional monitoring, notifications, and contingency actions if the vapor intrusion pathway is determined to be complete within a structure
- Section 5.0 – provides a list of references used in preparing this work plan



## SECTION 2.0 CURRENT IN-HOME AND EFFECTIVENESS MONITORING

Routine in-home monitoring is performed in accordance with the final *Interim In-Home Effectiveness Monitoring Plan* (Trihydro 2014b). In-home monitoring is currently performed on a weekly and quarterly basis to determine if mitigation measures (including operation of the SVE system) are effective at preventing migration of volatile petroleum related constituents into structures. Additionally, more frequent monitoring is performed within select structures as part of a river stage triggered event. The structures included in routine monitoring are summarized on Table 1 and depicted on Figure 4. Table 1 also provides a summary of the sampling frequency on a structure-by-structure basis.

In addition, effectiveness monitoring of the SVE system is performed on a quarterly basis within the nested multipurpose monitoring points, groundwater monitoring wells, and vapor monitoring probes, as described in the *Effectiveness Monitoring Plan* (URS 2014c). Effectiveness monitoring is currently performed to evaluate petroleum hydrocarbon concentrations and pneumatic influence of the SVE system primarily in the A-Clay and North Olive stratum. Data collected as part of the quarterly monitoring events is used to make adjustments to operations within the extraction wells. A list of the monitoring locations and construction details for the current effectiveness monitoring network is provided in Table 2 and depicted on Figure 4.

### 2.1. WEEKLY IN-HOME MONITORING

There are currently nine structures monitored on a weekly basis including: 107 W Birch, 117 W Birch, 129 W Birch, 119 W Date, 504 N Delmar, 516 N Delmar, 715 N Delmar, 507 N Olive, and 610 N Old St. Louis. It should be noted that three structures have been removed from the weekly monitoring program at the request of the property owners or tenants including 125 W Birch, 125 W Birch Rear, and 119 W Cherry. These three structures continue to be monitored during quarterly and river stage triggered events. Weekly in-home monitoring is conducted within the remaining structures as access is provided by the owner or tenant within the structure.

### 2.2. QUARTERLY IN-HOME MONITORING

Quarterly monitoring is conducted within an additional 33 structures (excluding the nine structures monitored on a weekly basis). As summarized in Table 1, quarterly monitoring within four locations

---

has been discontinued due to on-going refusal by the property owner or tenant to provide access or unsanitary conditions within the structure. Monthly monitoring was conducted between October 2013 and January 2014 to provide additional data for evaluating the effectiveness of the SVE system in mitigating the vapor intrusion pathway into overlying structures and to determine if quarterly in-home monitoring was sufficient. Subsequent to the January 2014 event, it was determined that quarterly monitoring was adequate and monthly monitoring was discontinued.

### **2.3. RIVER STAGE TRIGGERED MONITORING**

A river stage trigger event is defined by an increase in the Mississippi River stage to 14.5 feet (410 feet above mean sea level) as measured at the Mel Price (a.k.a., Alton) Lock and Dam, followed by an additional 2-foot rise over a 24-hour period. Once an event is triggered, another event cannot be triggered until at least one week later, if there is a subsequent two-foot rise in the river over a 24-hour period. Therefore, after an initial event, any subsequent 2-foot increase in the river stage over a 24-hour period (if the river remains above 14.5 feet) that occurs at least 8 days after the start of an event is considered a new event. In contrast, if another 2-foot increase occurs over a 24-hour period (assuming the river remains above 14.5 feet), prior to 8 days following the start of an event, this will not be considered a new event.

The Mississippi River stage at Mel Price Lock and Dam is tracked using the Advanced Hydrologic Prediction Service from the National Weather Service. The Advanced Hydrologic Prediction Service identifies a 14-day forecast projection for the tailwater depth which is used to forecast a potential event.

Once an event has been triggered, monitoring is performed, as soon as access can be obtained, within the 34 structures listed on Table 1. Depending upon access being granted, monitoring is performed every other day within each of these structures for a period of seven days, unless a longer timeframe is requested by the USEPA. The frequency and location of monitoring has been modified during several of the river stage triggered events (EBMP-25, EBMP-30, and EBMP-32) occurring over the past year, as approved by the USEPA.

### **2.4. QUARTERLY EFFECTIVENESS MONITORING**

Effectiveness monitoring is routinely performed within 146 monitoring locations including vapor monitoring probes (VMPs), vapor probes (VPs), multipurpose monitoring points (MPs), and groundwater monitoring wells (HMWs), as listed on Table 2. Many of these are constructed as

nested monitoring locations to allow evaluation of the various clay layers and hydrostratigraphic units. A description of the construction and completions for each of the four monitoring locations is provided in the following subsections. It should be noted that modifications to the surface completion including installation of ball valves in the vapor monitoring probes and vapor probes, as well as expandable well caps with a quick connect fitting in the multipurpose monitoring points and groundwater monitoring wells were performed between the second quarter and third quarter 2015. These modifications were made to improve the representativeness of the vapor samples collected during the quarterly events. The descriptions that follow include a summary of the modifications made to the monitoring locations.

#### **2.4.1. VAPOR MONITORING PROBES**

There are currently 61 vapor monitoring probes and a single vapor probe (VP-004S) included in the effectiveness monitoring network. Eight vapor monitoring probes have been paved over by the Village of Hartford along North Old St. Louis Road and North Olive Street since 2014. Vapor monitoring probes are constructed with 0.5-inch outside diameter stainless steel screen connected to 0.125-inch inside diameter stainless steel tubing extended to the ground surface. The stainless steel tubing is connected to a 0.25-inch stainless steel or brass ball valve inside a traffic rated flush mounted vault. Each probe is labeled and color coded to reflect its depth (white/clear - very shallow; yellow - shallow; red - medium; purple - deep).

#### **2.4.2. MULTIPURPOSE MONITORING POINTS**

There are currently 83 multipurpose monitoring points included in the effectiveness monitoring network. Monitoring points are larger in diameter than the vapor monitoring probes and were constructed in two different manners. The majority of the monitoring points are constructed with 1- or 2-inch diameter polyvinyl chloride (PVC) slotted screen and riser. These monitoring points have been fitted with an expandable well cap and a quick-connect fitting at the ground surface to allow collection of pneumatic measurements and soil vapor samples. The location identifier is generally present on the lid of the flush mounted vault for these monitoring points.

The remaining monitoring points have been constructed with a 1-inch diameter stainless steel screen attached to 0.5-inch diameter nylon tubing extended to the ground surface. The flexible tubing has been labeled and color coded to reflect its depth (yellow- shallow; red – medium; purple – deep). These monitoring points are completed with a quick-connect fitting within a traffic rated flush mounted vault at the ground surface.

### **2.4.3. GROUNDWATER MONITORING WELLS**

There are currently two groundwater monitoring wells (HMW-053A and HMW-054A) included in the effectiveness monitoring network. These wells are constructed with a 2-inch diameter PVC slotted screen and riser. These monitoring wells have been fitted with an expandable well cap and a quick-connect fitting at the ground surface to allow collection of pneumatic measurements and soil vapor samples. The location identifier is present on the lid of the flush mounted vault at each well.

## **2.5. MONITORING PROCEDURES**

Beginning in 2004 and 2005, in-home and effectiveness monitoring entailed collection of ambient air and soil vapor samples for laboratory analysis of volatile petroleum related constituents. Over time, monitoring transitioned to field screening of total volatile petroleum hydrocarbons in indoor air and sub-slab soil vapor, with samples being collected for laboratory analysis only when it was anticipated that the vapor intrusion pathway might be complete within a structure.

### **2.5.1. IN-HOME MONITORING PROCEDURES**

During in-home monitoring, indoor and outdoor air are screened for total volatile petroleum hydrocarbons including methane concentrations using a ThermoScientific TVA1000B™ flame ionization detector (FID), as well as percent of the lower explosive limit (%LEL) using a Rae Systems QRAE III® four gas meter. Field screening is performed within the lowest occupied space inside the structure, as well as the basement (if present). Indoor air is initially screened while travelling through the structure to the location of the sub-slab soil vapor probes. If total volatile petroleum hydrocarbon concentrations within the indoor air are equal to or exceed 10 parts per million by volume (ppmv), and cannot be attributed to an alternative source within the structure, then additional indoor air screening is performed. Additionally, the sub-slab soil vapor probes installed in each structure are monitored for the following:

- The pressure (or vacuum) is measured using Dwyer Series 475 Metz 111® manometer or an Ashcroft 2074® Digital Pressure Gauge
- The soil vapor in each sub-slab probe is field screened for total volatile petroleum hydrocarbon and methane concentrations using a ThermoScientific TVA1000B™ FID and photoionization detector (PID)
- Additionally, soil vapor is screened for %LEL and oxygen concentration using a Rae Systems QRAE III® four gas meter

- If groundwater is observed within a sub-slab vapor probe during collection of the pressure measurement, then field screening is not performed

If the total volatile petroleum hydrocarbon concentration exceeds 350 ppmv within a probe, then a soil vapor sample is collected in a Tedlar bag from that probe. The soil vapor sample is screened for the same field parameters using the same instruments identified in the previous bullets, in addition to fixed gases (oxygen and carbon dioxide) using a Landtec GEM 2000® gas analyzer.

Evaluation of the pathway using the field screening results is based on comparison of the total volatile petroleum hydrocarbon concentrations to action levels in indoor air and sub-slab soil vapor (unless the total volatile petroleum hydrocarbons are attributed to an alternate source within the structure such as a natural gas leak). The action levels for indoor air is 10 ppmv and the action level for sub-slab soil vapor is 350 ppmv. Soil vapor and indoor air samples are collected for laboratory analysis of select volatile petroleum related constituents if it is suspected that the vapor intrusion pathway is complete within the structure based on comparison of the field screening results to the action levels. The analytical results from the soil vapor and indoor air samples are then compared to the comparison values listed in Table 5-1 of the revised *Effectiveness Monitoring Plan* (ENSR 2007b). If the vapor intrusion pathway is determined to be complete and the concentration of any of the petroleum related constituents exceed a comparison value in indoor air, then a needs assessment evaluation and/or contingency measures (e.g., vapor removal from nearby monitoring wells, ventilation of the indoor air or crawlspace air, temporary relocation of residents in the structure, etc.) is conducted in accordance with the March 14, 2007 *Contingency Plan* (ENSR 2007a). It should be noted that contingency measures were last implemented in June 2014, prior to expansion of the vapor collection system in SVE Effectiveness Zone 1.

### **2.5.2. EFFECTIVENESS MONITORING PROCEDURES**

During quarterly effectiveness monitoring, the pressure (or vacuum) in each monitoring location is measured using Dwyer Series 475 Metz 111® manometer or an Ashcroft 2074® Digital Pressure Gauge. A soil vapor sample is then collected into a Tedlar bag from the monitoring location for field screening of the following parameters:

- Total volatile petroleum hydrocarbon and methane concentrations using a ThermoScientific TVA1000B™ FID and PID
- Fixed gases including oxygen and carbon dioxide using a Landtec GEM 2000® gas analyzer
- %LEL using a Rae Systems QRAE III® four gas meter

After collecting the pressure measurement and a soil vapor sample, fluid level measurements (depth to LNAPL and groundwater) are recorded in the multipurpose monitoring points and groundwater monitoring wells using a Solonist™ interface probe.

### **2.5.3. PNEUMATIC TESTING TO EVALUATE INTEGRITY AND SOIL VAPOR PERMEABILITY**

Between the second quarter 2015 and the first quarter 2016, pneumatic tests were performed within each of the sub-slab vapor probes during the quarterly monitoring events. In addition, pneumatic testing has been performed within each of the monitoring locations during the quarterly effectiveness monitoring events since the second quarter 2015, with the exception of the second quarter 2016 event.

Pneumatic testing consists of measuring the differential pressure within the monitoring location over increasing vapor extraction rates. A vacuum is imposed inducing a flow rate low enough to minimize line losses (varies based on the diameter of the monitoring location or probe). The pneumatic test results are used to calculate the soil gas permeability and specific capacity of the formation surrounding the screen interval of the monitoring location using equations provided in Johnson et al. (1990). Pneumatic test results can also provide an indication of a leak within a monitoring location.

## **2.6. DATA EVALUATION AND REPORTING**

Results from the in-home and effectiveness monitoring performed since the second quarter 2015 have been provided to the USEPA and Illinois EPA within the semiannual OMM reports for the SVE system. These reports include evaluation of the vapor intrusion pathway into each structure, as well as the effectiveness of the SVE system in recovering volatile petroleum related constituents in the shallow hydrostratigraphic units beneath the Hartford Site.



## **SECTION 3.0**

# **PROPOSED COMBINED EFFECTIVENESS MONITORING**

212 Environmental, on behalf of Apex, proposes combining the in-home and effectiveness monitoring programs, focusing on collection of routine data from outside of the structures to evaluate both the completeness of the vapor intrusion pathway and efficacy of the SVE system in reducing the mass of petroleum hydrocarbons beneath the Hartford Site. The current effectiveness monitoring network will be refined and the frequency of monitoring will be increased to allow for enhanced adjustments to the SVE system based on data collected from the shallow portions of the subsurface.

In addition, there will be a shift from screening total volatile petroleum hydrocarbon concentrations and fixed gases within and below structures during short duration events lasting just a few minutes to extended monitoring using passive samplers (e.g., Waterloo Passive Membrane Sampler™) followed by laboratory analysis of select petroleum related constituents. Collection of passive samples over an extended duration (e.g., several months) will allow for better quantification of the vapor intrusion pathway and estimation of inhalation risks for receptors over reasonable time integrated periods that better reflect average exposure concentrations.

Finally, 212 Environmental proposes changes to the current triggers and monitoring performed following a rapid increase in the Mississippi River stage. Changes to the triggers will be based on the data collected over numerous river stage triggered events performed since 2013. These changes to the current in-home and effectiveness monitoring programs are proposed in recognition of continually evolving conditions at the Hartford Site. Future monitoring will focus on improving operation of the SVE system where there is the potential for increased inhalation risks associated with a completed vapor intrusion pathway.

The transition to the proposed combined effectiveness monitoring program will be made iteratively. First, the effectiveness monitoring network will be refined and weekly and quarterly in-home monitoring will be discontinued. Next, studies will be conducted within two structures in SVE Effectiveness Zone 6 to compare evaluation of the vapor intrusion pathway using: (1) routine screening measurements, (2) analytical results reported from indoor air, outdoor air, and soil vapor samples collected using Summa® canisters over routine intervals, and (3) analytical results reported from indoor air, outdoor air, and soil vapor using passive samplers deployed over extended

---

durations. Lastly, field screening will be conducted within structures and the refined effectiveness monitoring network during several river stage triggered events (using revised triggers) to correlate evaluation of the vapor intrusion pathway using the in-home and external soil vapor screening results. Following these baseline monitoring events, in-home monitoring during subsequent river stage triggered events will be performed only when screening data collected from the effectiveness monitoring locations indicate the potential for a complete vapor intrusion pathway within a specific structure. Criteria for determining when monitoring is necessary within structures will be developed following the additional studies and river stage monitoring events.

This transition to a combined effectiveness monitoring program is supported by the following:

1. There have been significant reductions in the LNAPL mass within the shallow subsurface beneath the Hartford Site (primarily the North Olive stratum) over the past decade as demonstrated via decreases in the frequency and thickness of LNAPL in monitoring locations (212 Environmental 2016a), as well as changes in the laser induced fluorescence response (Trihydro 2014b).
2. There have been substantial reductions in the dissolved phase petroleum related concentrations (including benzene) in the shallow hydrostratigraphic units (including the North Olive and Rand strata) since routine monitoring began in 2004 (212 Environmental 2016a).
3. There has been an incomplete pathway for petroleum related constituents into structures (including during river stage triggered events) since June 2014 (Trihydro 2015b, 212 Environmental 2016b).
4. There have been increased incidences of property owners and tenants refusing access to structures during weekly, quarterly, and river stage triggered in-home monitoring events (Trihydro 2015b, 212 Environmental 2016b).
5. There is a high frequency of non-detect results repeatedly reported during the routine and river stage triggered in-home monitoring events that is not advancing optimization of the SVE system or development of the final remedy for the Hartford Site.
6. The data collected as part of in-home monitoring is only providing a qualitative measure of potential inhalation risks for occupants in structures during short duration events and does not represent reasonable time-weighted exposure concentrations for quantifying risks or evaluating the vapor intrusion pathway.

The remainder of this section describes the various components of the proposed combined effectiveness monitoring program including routine (monthly and quarterly) effectiveness monitoring (Section 3.1), passive ambient air and soil vapor monitoring within select structures (Section 3.2), as

well as river stage triggered monitoring (Section 3.3). A summary of routine inspection of the mitigation systems within select structures is also provided within Section 3.4. It is anticipated that modifications and refinements to the combined effectiveness monitoring program will be proposed in the future after collection of additional monitoring data during this initial transition.

### **3.1. EFFECTIVENESS MONITORING**

The effectiveness monitoring program has been revised following review of the routine data collected over the past two years and reported within the semiannual SVE system OMM reports (Trihydro 2015b, 212 Environmental 2016b). The effectiveness monitoring program will continue to focus on routine field screening for total volatile petroleum hydrocarbon and fixed gas (oxygen, carbon dioxide, and methane) concentrations, as well as pneumatic influence within the monitoring locations screened in the shallow portions of the subsurface (including the A-Clay and North Olive stratum). Monitoring locations will be selected that are appropriately constructed, similarly screened, and representative of subsurface conditions beneath structures (i.e., depth of the screen interval generally correlates to shallow depths beneath basements). The influence of nearby extraction wells will be considered when evaluating the soil vapor screening results and the migration pathway for volatile petroleum hydrocarbons in the subsurface.

Table 3 provides a list of the monitoring locations and construction details for the proposed effectiveness monitoring network. The distribution of the monitoring locations across the Hartford Site is presented on Figure 5. The monitoring locations were selected starting with an evaluation of the current effectiveness monitoring network. The competency of the existing monitoring locations has already been tested, surface completions have been modified to ensure collection of competent soil vapor samples, and recent monitoring data is available for these locations (Appendix A). The following additional criteria were then used in refining the monitoring network:

1. Monitoring locations screened below the North Olive stratum were removed from the monitoring network. These locations were constructed with screens intervals well below the bottom of most basements at the Hartford Site.
2. Monitoring locations with a top of screen that was less than 5 feet below ground surface (ft-bgs) were removed from the network, as these locations are prone to ambient air leakage and often times have higher concentrations of oxygen due to barometric pumping. Additionally, data collected from these locations may not reflect concentrations directly beneath a structure with a basement.

3. Monitoring locations with a top of screen greater than 15 ft-bgs were also removed from the monitoring network. Monitoring locations with screens deeper than 15 ft-bgs may reflect conditions within the deeper portions of the vadose zone below the dominant layer where aerobic biodegradation of petroleum hydrocarbons occurs. Data collected from these locations may not be representative of conditions directly beneath structures.
4. Monitoring locations that consistently had 10-feet or more feet of exposed well screen during the monitoring events conducted since the second quarter 2015 (as shown on Table 4) were also removed from the monitoring network. Soil vapor samples collected from these locations may contain mixtures of soil vapor from across extended portions of the vadose zone making it difficult to evaluate the vapor intrusion pathway.
5. Finally, there are a number of multipurpose monitoring points (MP-112 through MP-130) that were constructed with a 1-inch diameter stainless steel screen attached to 0.5-inch diameter flexible nylon tubing extending to the ground surface as described in Section 2.4.2. Based on analysis of the effectiveness monitoring results collected since the second quarter 2015 (Appendix A), these multipurpose monitoring points have a higher frequency of leakage compared to the other monitoring locations. Shut-in testing and the integrity of connections within these multipurpose monitoring points cannot be confirmed prior to collecting vapor samples for field screening.

Many of the nested vapor monitoring probes and multipurpose monitoring points that were removed from the monitoring network were nested with other locations screened in the A-Clay or North Olive stratum that were retained as part of the proposed effectiveness monitoring network. At these nested locations, a decision was made to use data collected from the vapor monitoring probe or multipurpose monitoring point that best reflects conditions directly beneath a structure. A spatial analysis of the monitoring locations that were proposed to be removed from the network was performed, and in many cases an existing location that was (1) adjacent to one of the removed locations, (2) not part of the existing network, and (3) met the preceding criteria was added to the proposed network, as provided on Table 3. Lastly, where there appeared to be significant spatial gaps in the monitoring network, additional soil vapor monitoring probes screened in the North Olive stratum are proposed, as shown on Figure 5.

It should be noted that data collected during effectiveness monitoring will primarily be used for evaluation of the vapor intrusion pathway beneath the Hartford Site and therefore unique from any other monitoring performed to optimize the SVE system. Additional monitoring may be conducted

within the monitoring locations installed in the deeper portions of the subsurface including the Rand, B-Clay, and Main Silt strata as necessary to support OMM of the vapor collection system components.

### **3.1.1. MONITORING PROCEDURES**

During effectiveness monitoring, the static pressure (which includes vacuum) in each monitoring location will be measured prior to conducting pneumatic testing or collecting a soil vapor sample for field screening. Currently pressure measurements are collected using a Dwyer Series 475 Metz 111 manometer or an Ashcroft 2074® Digital Pressure Gauge. These devices are capable of measuring vacuum with a resolution of 0.1 inches of water (in-H<sub>2</sub>O). However, a vacuum in the range of 0.025 to 0.035 in-H<sub>2</sub>O is generally sufficient to maintain pneumatic control and prevent vapor intrusion into structures (USEPA 2008). Therefore, a Dwyer Series HM35 Precision Digital Pressure Manometer®, or similar gauge, with higher resolution (0.001 in-H<sub>2</sub>O) will be used during effectiveness monitoring to better assess the influence of the SVE system in the shallow portions of the vadose zone beneath the structures at the Hartford Site.

After measuring the static pressure, a shut-in test will be performed at the monitoring location. Shut-in tests involve isolating the sampling equipment from the monitoring location using a ball valve, inducing a vacuum on the sampling equipment, and then confirming that the vacuum does not dissipate, which would be indicative of a leak and intrusion of atmospheric air into the sample. If a leak is noted, then fittings across the sampling train will be checked, tightened, and the shut-in test repeated until there is no leakage observed.

After conducting the shut-in test, pneumatic testing will be performed. Pneumatic testing consists of measuring the differential pressure within the monitoring location over increasing vapor extraction rates. A vacuum is imposed inducing a flow rate low enough to minimize line losses (varies based on the diameter of the monitoring location). The flow rate is increased in a stepwise fashion (e.g., 0.1, 0.25, and 0.5 liters per minute) using a rotameter. The stabilized differential pressure within the monitoring location is recorded at each flowrate using an Ashcroft 2074® Digital Pressure Gauge, or similar. Pneumatic testing is similar to slug testing within a groundwater monitoring well. The pneumatic test results are used to calculate the soil gas permeability and specific capacity of the formation surrounding the screen interval of the monitoring location using equations provided in Johnson et al. (1990). Pneumatic test results can also provide an indication of a submerged screen interval, leakage within a monitoring location, or fouling of the monitoring location over time.

Once pneumatic testing is complete, the monitoring location will be purged over a three- to five-minute interval at a flow rate high enough to ensure a minimum of five casing volumes of soil vapor have been removed from the screen and riser (or tubing). Purging will be performed to ensure that a representative soil vapor sample is collected from the formation for field screening purposes. The soil vapor sample will be field screened for total volatile petroleum hydrocarbon and methane concentrations using a ThermoScientific TVA1000B™ FID, as well as fixed gases including oxygen and carbon dioxide using a Landtec GEM 2000® gas analyzer.

After collecting the soil vapor sample, fluid level measurements (depth to LNAPL and groundwater) will be recorded in the multipurpose monitoring points and groundwater monitoring wells using a Solonist™ interface probe to assess the amount of open screen during each monitoring event.

### **3.1.2. FREQUENCY OF MONITORING**

Effectiveness monitoring will be performed across the proposed monitoring network on a quarterly basis. Additionally, monitoring will be conducted within a subset of the monitoring locations each month. Monthly monitoring will be conducted at those locations that are adjacent to structures that have been included in the weekly in-home monitoring program (Section 2.1), including those locations where the property owners have recently declined access. Monthly effectiveness monitoring will also be performed at locations adjacent to the two houses on East Birch Street, in which a baseline passive monitoring field study will be conducted, as described in Section 3.2.4. The locations that will be monitored on a monthly basis are listed in Table 3.

### **3.1.3. DATA VALIDATION**

Prior to data reduction and evaluation, the field screening results recorded during the monthly and quarterly effectiveness monitoring events will be validated to ensure that measurements are representative of soil vapor beneath a structure, as follows:

- The pneumatic test results will be reviewed to identify monitoring locations where the screen interval was plugged or occluded with groundwater.
- The depth to water will be compared to the top of the screen within the multipurpose monitoring points and groundwater monitoring wells to determine if the screen was occluded or more than 10-feet of exposed screen was present when monitoring was conducted.
- The total volatile petroleum hydrocarbon and oxygen field screening results collected at each location will be compared to determine if there is evidence for leakage within the sample. Specifically, soil vapor samples that contain elevated concentrations of total volatile petroleum

hydrocarbons (greater than 100 ppmv) and elevated concentrations of oxygen (exceeding 10%) will be considered outliers. Aerobic biodegradation of petroleum hydrocarbons results in decreasing concentrations of oxygen and reduced concentrations of volatile petroleum hydrocarbon concentrations in soil vapor. Aerobic biodegradation has the potential to reduce total volatile petroleum hydrocarbon concentrations by several orders of magnitude, as long as the supply of oxygen is not rate limited (DeVaull et al. 1997, DeVaull et al. 2002, Roggemans et al. 2001, Abreu et al. 2009, Michalski et al. 2012). With the exception of sites within a fractured bedrock setting (Thompson et al. 2012), it is not possible for both oxygen and total volatile petroleum hydrocarbons to be elevated within soil vapor from a single monitoring location unless leakage occurred during sample collection or samples are collected across an extended portion of the vadose zone (above and below the dominant layer).

Validation of the quarterly effectiveness monitoring events performed between the second quarter 2015 and third quarter 2016 was conducted using the validation methods described in the preceding bullets. A summary of the results collected during quarterly effectiveness monitoring over this timeframe is provided in Appendix A, including the well construction details, static pressure measurement, calculated soil gas permeability, field screening result for oxygen and total volatile petroleum hydrocarbons, and depth to water (if gauging could be performed) at each monitoring location. Monitoring locations with more than 10-feet of exposed screen during each of the quarterly effectiveness monitoring events have been summarized in Table 4. Locations with elevated concentrations of total volatile petroleum hydrocarbons and oxygen during each quarterly effectiveness monitoring event are summarized in Table 5. Additionally, example correlation plots showing oxygen versus total volatile petroleum hydrocarbon concentrations is included on Figure 6. Locations that were considered outliers due to elevated concentrations of oxygen and total volatile petroleum hydrocarbons are circled on Figure 6. It should be noted that the high number of outliers observed during the second and third quarter 2015 monitoring events have been attributed to atmospheric leaks in the sample train. Samples were collected using a hand held vacuum pump during these two events and quality control procedures including shut-in testing was not performed prior to purging the location and collecting the soil vapor sample (consistent with historical sampling procedures). To reduce ambient air leakage, ball valves were installed on the vapor monitoring probes and vapor probes; and expandable caps with a quick connect fitting were placed on the multipurpose monitoring points and groundwater monitoring wells following these two quarterly events.

### **3.1.4. DATA REDUCTION AND REPORTING**

Following validation, the quarterly and monthly effectiveness monitoring results will be tabulated and reviewed to evaluate the vapor intrusion pathway beneath the Hartford Site. Specifically, the data will be analyzed to determine if there are portions of the shallow subsurface (A-Clay and North Olive stratum) where anoxic conditions (oxygen concentrations below 2%) and elevated concentrations of total volatile petroleum hydrocarbons (greater than 350 ppmv) may be present. These conditions may indicate that aerobic biodegradation is rate limited and there is the potential for a complete vapor intrusion pathway into nearby structures, in the absence of adequate pneumatic influence associated with operation of nearby SVE wells. Therefore, the data evaluation will also consider the static pressure measurements in the monitoring locations, as well as the routine OMM data collected from the vapor collection system components (primarily the extraction wells). If it is determined that there is not sufficient pneumatic control from the operating extraction wells, then adjustments will be made to the nearby portions of the vapor collection system and additional monitoring will be performed within those locations where effectiveness monitoring results indicate the potential for a complete vapor intrusion pathway. Field screening may also be performed in nearby structures, where in-home monitoring has been performed in the past (i.e., sub-slab probes are currently installed within the building slab).

Results from the routine effectiveness monitoring will continue to be reported to the USEPA and Illinois EPA within the semiannual OMM reports for the SVE system. These reports will include an evaluation of the vapor intrusion pathway into each structure, as well as the effectiveness of the SVE system in recovering volatile petroleum related constituents in the shallow hydrostratigraphic units beneath the Hartford Site.

Adjustments made to the vapor collection system components (e.g. adjusting stingers or flowrate within specific extraction wells) and the response in the nearby monitoring locations (including any in-home screening results collected from nearby structures) will also be provided to the USEPA and Illinois EPA via email, if it is determined that there is the potential for the vapor intrusion pathway to be complete based on the effectiveness monitoring results. Notification and response actions for the effectiveness monitoring program are provided in Section 4.0.

### **3.2. PASSIVE IN-HOME MONITORING**

Collection of samples for laboratory analysis using passive samplers (e.g., Waterloo Passive Membrane Sampler™) deployed over an extended timeframe will be performed in selected structures

in lieu of the current in-home monitoring program, which primarily relies on field screening of short duration grab samples within indoor air and sub-slab soil vapor to evaluate the completeness of the vapor intrusion pathway. As described within the USEPA Office of Solid Waste and Emergency Response (OSWER) *Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air* (USEPA 2015), passive sampling techniques have been demonstrated through a number of studies (McAlary et al. 2015, McAlary et al. 2014a, 2014b, 2014c, Odenchantz et al. 2009, Odenchantz et al. 2008) to produce results that are comparable to those obtained from sampling conducted using more traditional techniques (i.e., Summa® canisters). A passive sampler is a device that contains a sorbent material within an inert container that has openings of a known size, which allow for volatile and semivolatile organic constituents to easily pass through and be absorbed at a steady uptake rate. Passive samplers are small and can be deployed in both ambient air, as well as installed in the subsurface for the collection of sub-slab and deeper soil vapor samples. Passive samplers offer several advantages over short duration grab samples including:

- Less disruption to the property owner as the passive samplers can be deployed for longer time periods and are quickly installed and retrieved
- Provide a means for collecting time-integrated samples that represent average exposure concentrations over longer timeframes
- Eliminate the low and high bias that can occur with grab samples due to temporal and seasonal variability

Collecting passive samples over extended timeframes allows for a more accurate means of assessing inhalation risk rather than biasing sample collection during worst case conditions (e.g., river stage triggered events), as typically performed via collection of grab samples from sub-slab soil vapor or indoor air. The time-weighted concentrations reported from the passive samplers deployed in indoor air, outdoor air, and soil vapor can be used to evaluate the vapor intrusion pathway into a structure, as well as potential inhalation risks based on a comparison to generic screening levels, such as the USEPA Vapor Intrusion Screening Levels (USEPA 2016).

### **3.2.1. PASSIVE SAMPLE COLLECTION AND ANALYSIS**

Passive samples will be collected from a minimum of two structures at any given time and will be rotated between structures that are currently part of the weekly in-home monitoring program, identified in Section 2.1. Passive samples will be collected from the indoor air and from locations adjacent to existing sub-slab probes, similar to the current in-home monitoring program. The indoor

air sample will be collected from the lowest level of the home in a central location at a height of between 3 and 5 feet, consistent with the typical breathing height of a building occupant. Additionally, samples will be collected from outdoor air and shallow portions of the vadose zone. This data set will allow a complete evaluation of the vapor intrusion pathway, including an understanding of petroleum related constituents present in the shallow subsurface, as well as ambient concentrations present in outdoor air from background sources such as the refineries and terminals surrounding the Hartford Site.

The indoor and outdoor air passive samplers will be attached to a secure location using wire ties or similar at the desired height. Sub-slab samples will be deployed within a ½-inch sub-slab probe installed within the building foundation. The sub-slab probe will be constructed with a stainless steel outer casing and re-sealable, air tight, threaded cap. Vapor samples will be collected from the shallow subsurface using existing multipurpose monitoring points or groundwater monitoring wells screened within the A-Clay or North Olive stratum situated adjacent to the structures historically included in the weekly in-home monitoring network. The passive samplers will be secured in the well or monitoring point using a wire lead. The sampler will be positioned immediately above the top of the screen interval and an airtight, expandable cap will be secured at the top of the casing at ground surface. The passive samples will be submitted to the laboratory for analysis of petroleum related constituents via USEPA Method TO-17, or similar.

### **3.2.2. DATA VALIDATION**

The analytical results will be validated to determine if they meet the data quality requirements for evaluation of the completeness of the vapor intrusion pathway. Validation of laboratory results will be performed in general accordance with criteria set forth in the USEPA Contract Laboratory Program (CLP) *National Functional Guidelines for Superfund Organic Methods Data Review* (USEPA 2008), with additional reference to USEPA CLP *National Functional Guidelines for Organic Data Review* (USEPA 1999b). Review of duplicates will be conducted in accordance with the USEPA Region 1 *Laboratory Data Validation Functional Guidelines for Evaluation of Organic Analysis* (USEPA 1996). Additional reference will be made to the *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, Compendium Method TO-17, Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling onto Sorbent Tubes* (USEPA 1999a). The criteria of precision, accuracy, representativeness, completeness, and comparability will be evaluated as follows:

- Precision is a measure of variability among individual sample measurements and evaluated by comparison of laboratory and field duplicate results using the relative percent difference.
- Accuracy is a measure of the analytical bias (difference between the actual sample analyte value and the measured sample analyte value) and is evaluated by analyzing samples/constituents of known concentration (initial and continuing calibration, surrogate compounds added to samples during analysis, laboratory control samples, etc.) and calculating the percent recovery.
- Representativeness is a measure of the degree to which the data set accurately reproduces the characteristics of the population and is a function of selecting sampling locations that adequately represent the whole population. Representativeness is evaluated in the field by examining field parameters collected during sample collection. This step is particularly important when validating vapor samples because atmospheric air may be introduced into a sample through a leak in the sampling train that is not observable. Representativeness of the analytical data is evaluated through instrument performance checks, initial and continuing calibration, laboratory blanks, internal standards, and sample homogenization.
- Completeness is a measure of the amount of data collected, analyzed, and validated compared to the target specified in the work plan and is evaluated by calculating the percentage of the number of valid data points relative to the number that were planned.
- Comparability is a qualitative measure of the confidence with which one data set can be compared against another. Comparability is ensured during work plan development by specifying sampling methods that are consistent with those of other data sets. Comparability is evaluated during data validation by checking for consistency in analytical process (e.g., correct method used for all analysis, same analytes reported, same units reported, holding times were met, consistency in detection limits).

The laboratory uses a variety of blanks, surrogates, and calibration samples to evaluate the quality of the analytical procedures, identify any laboratory-introduced contamination, and assess the representativeness of the analytical results. Data qualifiers will be added to the analytical results based upon comparison of each of these criteria with laboratory and data validation established control limits.

### **3.2.3. DATA REDUCTION AND REPORTING**

Following validation, the analytical results will be tabulated and reviewed to evaluate the vapor intrusion pathway into the sampled structure. The analytical results from the passive sampling program will be compared to risk-based screening levels developed using the USEPA Vapor Intrusion

Screening Level (VISL) Calculator (USEPA 2016). The VISLs are developed with consideration for uncertainty, and are designed to be overly protective; therefore, concentrations above the screening levels do not necessarily pose an unacceptable risk. Screening levels that will be used for the vapor intrusion pathway assessment at the Hartford Site assume a lifetime incremental cancer risk of 1E-06 for carcinogenic constituents and a Hazard Quotient of 1.0 for non-carcinogenic risk. The VISLs are adjusted for soil vapor by applying an attenuation factor of 0.03 (USEPA 2015).

One of the key components in determining if volatile constituents from the subsurface are potentially affecting human health, is an understanding of the migration route from beneath the structure into indoor air. Detections of petroleum related constituents in indoor air would only be indicative of a complete pathway for vapor intrusion if those volatile constituents are greater than those expected due to alternate sources within the structure or outdoor air. Volatile constituents are ubiquitous in indoor and outdoor air from a variety of other sources including automobiles, gasoline powered tools, water treatment chemicals and byproducts, a variety of different consumer products, insecticides, pesticides, glues, cleaners, degreasers, lubricants, oils, and building materials. Furthermore, many volatile petroleum and non-petroleum related constituents are present in structures where cigarettes or similar tobacco products are used.

Upward migration of vapors via diffusion and advection from potential sources in soil and groundwater beneath overlying structures are offset by dilution with ambient air in the structure. The vapor intrusion pathway cannot be considered complete unless volatile constituents are measured at higher concentrations beneath the building compared to indoor air. This decrease in the concentration of volatile constituents from soil vapor into indoor air is generally termed attenuation. The soil vapor to indoor air attenuation factor provides the best single line of evidence to indicate whether vapor intrusion may be the cause of volatile constituents detected in indoor air. Recent studies conducted by the USEPA (2012) have defined the range of attenuation observed within buildings where vapor intrusion has been shown to be occurring. The soil vapor to indoor air attenuation factor (including deeper soil vapor and sub-slab soil vapor) has been conservatively estimated at 0.03 (95% upper confidence interval, USEPA 2012) based on evaluations using recalcitrant chlorinated solvents including tetrachloroethene and trichloroethene. This soil vapor attenuation factor is conservative for assessment of the vapor intrusion pathway associated with petroleum release sites, as it does not account for attenuation occurring due to aerobic biodegradation of volatile petroleum hydrocarbons in the vadose zone.

The results of the pathway evaluation using the passive sampling analytical results will be reported to the USEPA and Illinois EPA within the semiannual OMM reports for the SVE system. If it is determined that there is the potential for the vapor intrusion pathway to be complete based on the passive monitoring results, then the USEPA and Illinois EPA will also be contacted via email. Notification and response actions are summarized in Section 4.0.

### **3.2.4. BASELINE STUDY**

An initial baseline study will be conducted over a three-month timeframe within two structures, prior to implementation of the passive monitoring program. The baseline study will be performed to demonstrate the viability of the passive sampling results with comparison to the current in-home monitoring program including field screening and collection of indoor air and sub-slab samples using Summa® canisters. The primary purpose of the baseline study is to determine if the passive sampling technique provides defensible data for evaluating the vapor intrusion pathway and to determine if passive sampling can be used in place of the historical in-home monitoring program. The baseline study will also define several inputs for future passive monitoring including selection of appropriate sorbent media, passive sampling device, and sample collection duration. For example, if a passive sampler is deployed for too short of a period, the reporting limits may be too high to compare to risk-based screening levels. Alternatively, if a sample is deployed for too long of a time period then the sorbent media can become saturated and breakthrough will occur resulting in sample concentrations that may be biased low.

The one-time baseline study will be conducted at two unoccupied structures located on East Birch Street within SVE Effectiveness Zone 6, as shown on Figure 5. One of the locations has a basement, while the other structure is slab-on-grade construction. The selected locations are situated near extraction well HSVE-099, in an area underlain with elevated total volatile petroleum hydrocarbons. The use of unoccupied structures will allow for removal of any chemicals (e.g., household cleaners, paints, gasoline, etc.) prior to the study to reduce the impact that these alternate sources may have on indoor air or sub-slab soil vapor analytical results.

Soil vapor samples and field screening will be performed in indoor air, outdoor air, sub-slab soil vapor, and soil vapor within a monitoring location situated adjacent to the structures (Figure 5). This will allow for evaluation of the vapor intrusion pathway and any contribution of volatile constituents from ambient sources, as well as the comparability between the different sampling methods.

Monitoring locations will be the same or similar for each sampling method during the study and will include the following:

- Field screening of indoor air, outdoor air, and soil vapor three times each week
- Collection of indoor air, outdoor air, and soil vapor samples for laboratory analysis using Summa® canisters twice each month
- Collection of passive samples in indoor air, outdoor air, and soil vapor on one-month, two-month, and three-month intervals.

Ambient weather data including temperature, precipitation, barometric pressure, wind direction and wind speed will also be recorded daily during the baseline study. A description of each of these data collection methods is provided in the following subsections.

#### **3.2.4.1. FIELD SCREENING**

In-home field screening will be conducted throughout the duration of the baseline study three times per week following the procedures described in Section 3.1.1. This will include measuring pressure, performing shut-in and pneumatic testing, purging, field screening, and recording fluid levels (if applicable) within each sub-slab vapor probe within the structures, as well as the monitoring location situated adjacent to the structures.

#### **3.2.4.2. COLLECTION OF SAMPLES USING SUMMA CANISTERS**

Indoor air, outdoor air, and soil vapor samples will be collected for laboratory analysis using Summa® canisters on a bimonthly basis throughout the course of the three-month baseline study. The sample collection techniques will include the following:

- Indoor and outdoor air samples will be collected using 100% certified clean, 6-liter passivated Summa® canisters. These samples will be collected using a 24-hour flow controller and submitted for laboratory analysis of volatile petroleum related constituents using USEPA Method TO-15.
- Soil vapor samples will be collected in a 100% certified clean, 6-liter passivated Summa® canisters. The soil vapor samples will be collected using a minimum of a 200-milliliter per minute flow controller and submitted for laboratory analysis of volatile petroleum related constituents of concern using USEPA Method TO-15 and fixed gases (oxygen, carbon dioxide, and methane) using USEPA Method 3C. The representativeness of the soil vapor sample will be ensured during sample collection via shut-in testing and helium tracer testing.

### **3.2.4.3. COLLECTION OF PASSIVE SAMPLES**

Indoor air, outdoor air, and soil vapor samples will be collected using passive sample devices (e.g., Waterloo Passive Membrane Sampler™) following the methodology outlined in Section 3.2.1. Three sets of passive samplers will be deployed at each monitoring location within and outside the structures simultaneously. On a monthly basis one set will be retrieved, over a period of three months, and submitted for analysis of volatile petroleum related constituents using USEPA Method TO-17, or similar. This will provide passive sampling results at one-month, two-month, and three-month intervals. Passive samplers will be deployed in the indoor and outdoor air, at the same location where the Summa® canisters are deployed. Additionally, passive samplers will be deployed in the sub-slab and vapor monitoring location following the same methods described in Section 3.2.1.

### **3.2.4.4. EVALUATION OF ACUTE RISKS**

The final component of the baseline study includes an evaluation of acute risks within the structures. Acute risks at petroleum release sites primarily consist of the accumulation of methane beneath the structure that can lead to fires or explosive conditions (Kram et al. 2014, Kram et al. 2015). While there is no evidence that an acute risk is present beneath the Hartford Site, as is demonstrated by the last two years of in-home monitoring results, which has shown that %LEL and total volatile petroleum hydrocarbon concentrations are well below acute risk thresholds (in addition to demonstrating that the vapor intrusion pathway is incomplete, even under worst-case conditions such as a river stage trigger event), an evaluation will be conducted to ensure that such risks are not overlooked via the collection of passive samples over extended timeframes. One approach for evaluating the potential for acute risks is to conduct a building depressurization test, which will result in vapor migration from the subsurface, creating an engineered worst-case scenario (McAlary et al. 2016). Building depressurization can provide an evaluation of acute risks over a short time frame (typically a few hours).

Building depressurization testing will be conducted at the two structures included in the baseline study using a blower door as described within American Society for Testing and Materials (ASTM) *Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door* (ASTM 2011). While the building is depressurized, field screening will be conducted in the indoor air and sub-slab soil vapor as described in Section 3.1.1. Indoor air and sub-slab soil vapor samples will also be collected for laboratory analysis using 100% certified clean, 6-liter passivated Summa® canisters. The sub-slab soil vapor samples will be collected using a minimum of a 200-milliliter per minute flow

controller and submitted for laboratory analysis of volatile petroleum related constituents using USEPA Method TO-15. The sub-slab samples will also be submitted for fixed gases (oxygen, carbon dioxide, and methane) using USEPA Method 3C. The representativeness of the soil vapor sample will be ensured during sample collection via shut-in and helium tracer testing.

### **3.2.4.5. DATA EVALUATION AND REPORTING**

Data collected during the baseline study, including the field screening and analytical results, will be validated prior to compilation and review following the procedures outlined in Sections 3.1.3 and 3.2.2. The data will then be tabulated and reviewed to:

- Evaluate the comparability between the various sampling methodologies
- Assess the viability of using passive samplers for future in-home monitoring
- Define inputs for future passive monitoring including selection of appropriate sorbent media, passive sampling device, and sample collection duration

A summary of the baseline study results will be prepared and provided to the USEPA and Illinois EPA. The baseline summary report will also include an evaluation of the completeness of the vapor intrusion pathway into the two structures, as well as potential acute and chronic inhalation risks over the course of the three-month study.

### **3.3. RIVER STAGE TRIGGERED MONITORING**

The relationship between rising river stage, increasing groundwater elevations, and completed vapor intrusion events has been postulated since the early 1970s at the Hartford Site. Evidence of odor complaints and elevated concentrations of petroleum hydrocarbons beneath structures attributed to rainfall events and rising groundwater elevations were referenced in a number of reports prepared by the various refineries and their consultants between the 1970s and 1990s (USEPA 2010). It was identified that more than 70% of the reported vapor intrusion related complaints over the past 40 years occurred when the Mississippi River stage increased at a rate of two feet or more per day, when the river elevation was already above 410 ft-amsl (ENSR 2008).

In 2007, the river stage event based monitoring program was first considered within the draft *Revised Effectiveness Monitoring Plan* (ENSR 2007b) to determine factors and conditions that could lead to vapor intrusion within structures at the Hartford Site. Time-series analyses indicated that elevated river stage was the primary indicator for a completed pathway into structures and precipitation had

less of a clearly defined correlation with vapor intrusion events. As such, a river stage trigger was defined as:

1. The Mississippi River elevation as measured at the Mel Price Lock and Dam exceeded 415 ft-amsl (corresponding to a stage of 19.5 feet).
2. A subsequent event could not be triggered for two weeks thereafter and only if the Mississippi River elevation decreased below 415 ft-amsl and then increased again above this threshold.
3. A secondary trigger was proposed at a river elevation of 420 ft-amsl (corresponding to a river stage of 24.5 feet). Again a second event could not be triggered until two weeks following the initial event.

This original definitions of the river stage triggers recognized that there needed to be adequate time and fluctuation of the water table to allow volatile petroleum related hydrocarbons to accumulate within the vadose zone before advective flux associated with increasing groundwater elevations could transport the volatile constituents into overlying structures. The river stage trigger was subsequently revised in 2007, to the criteria currently used at the Hartford Site and described in Section 2.3.

Monitoring during river stage triggered events has historically been focused within structures. In 2008, changes to the event based monitoring program were proposed within the *Technical Basis for Event-Based Monitoring Thresholds* (AECOM 2008) and the draft *Hartford Hydrocarbon Plume Site Event-Based Monitoring Plan, Hartford, Illinois* (AECOM 2009). Specifically, secondary criteria were proposed to determine where in-home monitoring should be focused during an event. The secondary criteria included significant increases in soil vapor concentrations, as well as static pressure measured in the shallow and deeper portions of the subsurface. Following initiation of an event, monitoring would be performed within an extensive monitoring network (more than 250 locations) to evaluate changes in the shallow and deeper portions of the subsurface. These secondary criteria for in-home monitoring have not been used during river stage triggered events.

### **3.3.1. RECENT EVENT SUMMARY**

Figure 7 provides a summary of the river stage triggered monitoring events that occurred between December 2012 and September 2016 (events EBMP-15 through EBMP-32), including a comparison of the Mississippi River elevation (recorded daily) to groundwater elevations in the Rand and Main Sand stratum (also recorded daily). In addition, this figure includes a tabular summary of precipitation occurring the week prior and the week of the event, water generation reported at the thermal

treatment system in the week prior and the week of the river stage triggered event, and the location and maximum concentration of total volatile petroleum hydrocarbons measured in indoor air and sub-slab soil vapor during each event. Finally, this figure includes significant findings and activities that occurred during several of the river stage triggered events.

A completed vapor intrusion pathway (as indicated by exceedances of comparison values in both the sub-slab soil vapor and indoor air) was observed in three structures on West Birch Street (107, 125, and 129) during river stage triggered events EBMP-15 through EBMP-19, between March 2013 and April 2014. It is possible that the vapor intrusion pathway may have also been complete within these three structures during event EBMP-20 in June 2014; however supplemental recovery of volatile hydrocarbons along West Birch and West Arbor Streets was performed using multipurpose monitoring points MP-078B, MP-078C, and MP-079C, once the trigger thresholds were reached. There has not been any evidence of a completed vapor intrusion pathway into any of the structures at the Hartford Site during a river stage triggered event since June 2014. This includes three river stage triggered events (EBMP-21 through EBMP-23) that occurred prior to the installation and connection of three pairs of nested extraction wells (HSVE-105S/D, HSVE-106S/D, and HSVE-107S/D) to the vapor collection system along West Birch and West Arbor Streets (within SVE Effectiveness Zone 1).

Significant increases in total volatile petroleum hydrocarbon concentrations in sub-slab soil vapor are typically observed when the river elevation falls below 400 ft-amsl prior to increasing above the river stage trigger thresholds. This can be observed during monitoring events EBMP-15 and EBMP-19 prior to installation of the additional extraction wells in SVE Effectiveness Zone 1, and to a significantly lesser degree during events EBMP-24 and EBMP-26 following installation of the new extraction wells. It is possible that portions of the LNAPL smear zone that are typically submerged beneath groundwater must be exposed at lower water table elevations (corresponding to a river elevation of 400 ft-amsl) in order to allow volatile petroleum related hydrocarbons to accumulate within the vadose zone before advective flux associated with increasing river stage and groundwater elevations can transport the volatile constituents to shallow depths beneath overlying structures.

During several of the river stage monitoring events that have occurred during the past two years, it has been observed that elevated soil moisture content due to frequent precipitation events and high groundwater conditions were limiting vapor transport into structures, as well as recovery of volatile petroleum hydrocarbons via the SVE system (e.g., EBMP-25). While precipitation and associated water generation rates recorded at the thermal treatment system are useful in understanding the

migration of petroleum related constituents beneath the Hartford Site after a trigger has been reached, it is difficult to correlate these data sets to the specific outcomes (such as a completed pathway within a structure) during an event.

### **3.3.2. REVISED RIVER STAGE TRIGGER CRITERIA**

The 2007 proposed and current river stage trigger (minimum trigger elevation) are shown on Figure 7. Based on an evaluation of daily river stage measurements recorded between December 2004 and September 2016 (included in Appendix B), the current initial river elevation trigger of 410 ft-amsl represents the 73<sup>rd</sup> percentile (n = 4,280) of river stage measurements. The minimum additional river stage increase to trigger an event (2.0 feet within a 24-hour period) is equivalent to the 78<sup>th</sup> percentile. If the proposed 2007 event definition criteria were applied to the current river stage dataset, the primary trigger (415 feet) would represent the 86<sup>th</sup> percentile and the secondary trigger (420 feet) would represent the 94<sup>th</sup> percentile of the river stage measurements.

Since there has not been a completed vapor intrusion pathway within any of the structures at the Hartford Site for more than two years (including an absence of total volatile petroleum hydrocarbons in sub-slab soil vapor during the most recent three events), 212 Environmental, on behalf of Apex is proposing to refine the river stage triggers as follows:

1. An event cannot be triggered if the Mississippi River stage does not decrease below 400 ft-amsl (corresponding to a river stage of 4.5 feet), representing the 25<sup>th</sup> percentile (n = 4,280) of river stage measurements
2. Once this initial criterion has been met, an event will be triggered if the Mississippi River as measured at the Mel Price Lock and Dam increases to 412.5 ft-amsl (corresponding to a river stage of 17 feet), which represents the 80<sup>th</sup> percentile of river stage measurements, followed by an additional 2-foot increase within a 24-hour period (representing the 85<sup>th</sup> percentile of river stage measurements)
3. A subsequent event cannot be triggered until the Mississippi River elevations decrease below 400 ft-amsl

### **3.3.3. REVISED RIVER STAGE MONITORING PROGRAM**

Monitoring during the next three river stage triggered events will be performed to evaluate the revised trigger criteria, as well as correlate evaluation of the vapor intrusion pathway using the in-home field screening and external soil vapor screening results. During the next three river stage triggered monitoring events, in-home monitoring will be performed within the structures shown on

Figure 5 and identified as being part of the river stage triggered monitoring network in Table 1. Effectiveness monitoring will be conducted concurrently within the effectiveness monitoring locations identified on Figure 5 and listed in Table 3. In-home and effectiveness monitoring will be conducted in general accordance with the procedures outlined in Section 3.1.1 and will include the following:

- The indoor air within a structure will be screened for total volatile petroleum hydrocarbons and methane using a ThermoScientific TVA1000B™ FID. Screening will be performed within the lowest occupied space within the structure, as well as the basement. Indoor air will initially be screened while travelling through the house to the sub-slab soil vapor probes. If the indoor air concentrations are equal to or exceed 10 ppmv, and cannot be attributed to an alternative source within the structure, then additional screening of the lowest occupied space will be performed.
- The static pressure in the sub-slab soil vapor probes, vapor monitoring probes, multipurpose monitoring points, or groundwater monitoring wells will be measured using a Dwyer Series HM35 Precision Digital Pressure Manometer®, or similar gauge, with higher resolution (0.001 in-H<sub>2</sub>O).
- After recording the static pressure, shut-in and pneumatic testing will be performed in the monitoring location or sub-slab probe.
- Soil vapor will then be purged and field screened for total volatile petroleum hydrocarbon and methane concentrations using a ThermoScientific TVA1000B™ FID, as well as fixed gases including oxygen and carbon dioxide using a Landtec GEM 2000® gas analyzer.
- Following field screening, fluid levels will then be gauged in the multipurpose monitoring points and groundwater monitoring wells using a Solonist™ interface probe.

The data collected from the in-home and effectiveness monitoring networks during the river stage triggered events will be validated and reduced in accordance with the procedures outlined in Section 3.1.3 and 3.1.4. The results will be evaluated for completeness of the vapor intrusion pathway into each structure.

Following the completion of the three river stage triggered events, a separate report will be prepared and submitted to the USEPA and Illinois EPA, providing an evaluation of the refined river stage trigger criteria. In addition, this report will include an evaluation of the concurrent in-home and effectiveness monitoring data to determine if revisions to the effectiveness monitoring or river stage monitoring programs are warranted.

### **3.4. MITIGATION MEASURES INSPECTION AND MAINTENANCE ACTIVITIES**

Mitigation measures have been implemented in many of the structures across the Hartford Site. In-home mitigation measures have included patching cracks in the basement floor and walls, emplacing low-permeability vapor barriers in crawlspaces (historically referred to as flowable fill), installing ventilation blowers in basements and crawlspaces, installing sub-slab depressurization systems, placing combustible gas and carbon monoxide meters in basements, sealing basement floor drains with Dranjer® seals, or providing AllerAir™ 5000 Series indoor air purifying systems. Inspection and maintenance of these measures will be performed routinely within the structures included on Table 1. Inspection and maintenance activities will include the following activities.

- The integrity of the basement floor and walls, as well as the flowable fill in the crawlspace (where applicable) will be visually inspected annually to determine if any cracks have developed. If any cracks are noted within the basement floor, walls, and/or flowable fill, they will be sealed using a durable caulk or hydraulic cement, as needed.
- Both combustible gas and carbon monoxide meters will be visually inspected and a self-test of the carbon monoxide meter will be conducted on an annual basis.
- Blowers used for sub-slab depressurization, indoor ventilation, or crawlspace ventilation will be visually inspected and started (if not already running) to confirm normal operation on an annual basis. If a blower is damaged or not operational, it will be repaired or replaced.
- Dranjer® seals will be cleaned using water to remove any potential blockage within the floor drain(s). If a blockage is noted and cannot be cleared by running water through the drain, then the Dranjer® seal will be removed from the drain and manually cleaned or replaced.
- Particulate filters and granular activated carbon (GAC) filters present in the AllerAir™ air purifiers will be inspected on an annual basis. This will include a visual and olfactory (to identify any sour odor emanating from the filter exhaust) inspection. If a sour odor is noted in the GAC filter or the particulate filter appears to be full of dirt and dust, then these filters will be replaced. At a minimum the particulate and GAC filter will be replaced on three year intervals. Filters were replaced in all of the AllerAir™ air purifiers in the first quarter 2016.



## **SECTION 4.0**

# **NOTIFICATION AND CONTINGENCY MEASURES**

If during the course of routine effectiveness and/or river stage triggered monitoring activities it is determined that a completed vapor intrusion pathway may be present within a structure, then additional monitoring will be conducted. Additional monitoring activities will include collection of outdoor air, indoor air, and sub-slab soil vapor samples within the structure.

Indoor air samples will be collected from the basement and/or crawlspace (if one is present within the structure). Basement or crawlspace air samples will not be collected if the source of the total volatile petroleum hydrocarbons measured using the FID can be attributed to an alternate source within the structure, such as a natural gas leak. The indoor and outdoor air samples will be collected using batch certified clean, 6-liter passivated Summa® canisters. These samples will be collected using a 24-hour flow controller and submitted for laboratory analysis of volatile petroleum related constituents using USEPA Method TO-15.

A soil vapor sample will also be collected from the sub-slab soil vapor probe with the highest total volatile petroleum hydrocarbon concentration (or from a probe selected by the field team if all the concentrations beneath the slab are the same) to assess the vapor intrusion pathway beneath the structure. The soil vapor sample will be collected in a batch certified clean, 6-liter passivated Summa® canister and analyzed for volatile petroleum related constituents of concern using USEPA Method TO-15. The soil vapor sample will be collected using a minimum of a 200-milliliter per minute flow controller. The representativeness of the soil vapor sample will be ensured during sample collection via shut-in testing and helium tracer testing.

The indoor air, outdoor air, and sub-slab soil vapor analytical results will be compared to the VISLs (USEPA 2016). The VISLs are developed with consideration for uncertainty, and are designed to be overly protective; therefore, concentrations above the screening levels do not necessarily pose an unacceptable risk. Screening levels that will be used for the vapor intrusion pathway assessment at the Hartford Site assume a lifetime incremental cancer risk of 1E-06 for carcinogenic constituents and a Hazard Quotient of 1.0 for non-carcinogenic risk. The VISLs are adjusted for soil vapor by applying an attenuation factor of 0.03 (USEPA 2015).

---

Representatives from the USEPA and Illinois EPA (listed in Table 6), will be contacted by email if any total volatile petroleum hydrocarbon concentrations in the sub-slab vapor probes are equal to or exceed 350 ppmv or the indoor air concentration is equal to or exceeds 10 ppmv within a structure. Representatives from the USEPA and Illinois EPA will also be contacted if there are any exceedances of petroleum related constituents in indoor air above the respective VISL (USEPA 2016).

Additionally, if petroleum related constituents measured in indoor air from any passive sample or Summa® canister sample reported by the laboratory exceed a VISLs and cannot be attributed to an alternate source in the structure or outdoor air via analysis of the vapor intrusion pathway, then a needs assessment evaluation and/or contingency measures (e.g., supplemental vapor recovery from nearby monitoring wells, ventilation of the indoor air or crawlspace air, temporary relocation of residents in the structure, etc.) will be conducted in accordance with the March 14, 2007 *Contingency Plan* (ENSR 2007a). Where alternate sources, such as natural gas leaks, are identified, future monitoring will be discontinued within that structure. In addition, measures to remove these alternate sources from the structure will be discussed, in the presence of the USEPA, with the property owner and/or tenant. Monitoring will be resumed once Apex has been notified that these mitigation measures were completed by the property owner or tenant.



## SECTION 5.0 REFERENCES

- 212 Environmental Consulting, LLC. (212 Environmental). 2016a. *Dissolved Phase Investigation Summary Report, Hartford Petroleum Release Site, Hartford, Illinois*. July 2016.
- 212 Environmental. 2016b. *Semiannual Soil Vapor Extraction System Operations, Monitoring, and Maintenance Report, October 2015 through March 2016, Hartford Petroleum Release Site Hartford, Illinois*. September 2016.
- Abreu, L., R. Ettinger, and T. McAlary. 2009. *Simulating the Effect of Aerobic Biodegradation on Soil Vapor Intrusion into Buildings: Evaluation of Low Strength Sources Associated with Dissolved Gasoline Plumes*. API Regulatory and Scientific Affairs Department API Publication 4775. American Petroleum Institute. Washington, DC. April 2009.
- AECOM, Inc. 2008. *Technical Basis for Event-Based Monitoring Thresholds*. November 2008.
- AECOM, Inc. 2009. *Hartford Hydrocarbon Plume Site Event-Based Monitoring Plan, Hartford, Illinois*. Draft. March 2009.
- ASTM (American Society for Testing and Materials). 2011. *E1827 Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door*. West Conshohocken, PA: ASTM International. <http://www.astm.org>.
- DeVaull, G. E., R. A. Ettinger, J. P. Salinitro, and J. B. Gustafson. 1997. "Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) Degradation in Vadose Zone Soils during Vapor Transport: First Order Rate Constants." Proceedings of the API/NGWA Petroleum Hydrocarbons and Organic Chemicals in Groundwater: Prevention, Detection and Remediation Conference. Houston, TX. November 12-14. 365-379.
- DeVaull, G. E.; Ettinger, R. A.; Gustafson, J. B. 2002. *Chemical vapor intrusion from soil or groundwater to indoor air: Significance of unsaturated zone biodegradation of aromatic hydrocarbons*. Soil and Sediment Contamination 2002. 11(4), 625-641.
-

ENSR International. 2007a. *Contingency Plan*. March 2007.

ENSR International. 2007b. *Revised Effectiveness Monitoring Plan*. June 2007.

ENSR International. 2008. *Time Series Analysis at Hartford*. 2008.

Illinois Environmental Protection Agency (Illinois EPA). 2004. *History of Hydrocarbon Plume in Hartford, Illinois*. Presentation 2004.

Johnson, P.C., Kemblowski, M.W., and Colthart, J.D. 1990. "Quantitative Analysis for the Cleanup of Hydrocarbon-Contaminated Soils by In-Situ Soil Venting". *Groundwater*. 1990. 28(3).

Kram, M. 2015. *The Emperor's Old Clothes: An Inconvenient Truth About Currently Accepted Vapor Intrusion Assessment Methods*. *Guest Editorial. Groundwater Monitoring and Remediation*. DOI: 10.1111/gwmr.12140. November 2015.

Kram, M. 2016. *Emperor's Old Clothes Revisited, Guest Editorial*. *Groundwater Monitoring and Remediation*. DOI: 10.1111/gwmr.12150. March 2016.

McAlary, T.A., X. Wang, A. Unger, H. Groenevelt, and T. Górecki. 2014a. *Quantitative passive soil vapor sampling for VOCs—Part 1: theory*. *Environ. Sci.: Processes Impacts* 16(3):482–490.

McAlary, T.A., H. Groenevelt, S. Seethapathy, P. Sacco, D. Crump, M. Tuday, B. Schumacher, H. Hayes, P. Johnson, and T. Górecki. 2014b. *Quantitative passive soil vapor sampling for VOCs—Part 2: laboratory experiments*. *Environ. Sci.: Processes Impacts* 16(3): 491–500.

McAlary, T.A., H. Groenevelt, P. Nicholson, S. Seethapathy, P. Sacco, D. Crump, M. Tuday, H. Hayes, B. Schumacher, P. Johnson, T. Górecki, and I. Rivera Duarte. 2014c. *Quantitative passive soil vapor sampling for VOCs—Part 3: field experiments*. *Environ. Sci. Processes Impacts* 16(3): 501–510. 14.

McAlary, T.A., H. Groenevelt, S. Disher, J. Arnold, S. Seethapathy, P. Sacco, D. Crump, B. Schumacher, H. Hayes, P. Johnson, and T. Górecki. 2015. *Passive sampling for volatile organic compounds in indoor air – Controlled laboratory comparison of four sampler types*. *Environ. Sci.: Processes Impacts* 17: 896–905.

McAlary, T.A., T. McHugh, B. Eklund, C. Lutes, E. Suuberg, H. Hayes, K. Pennell, D. Folkes, H. Dawson, R. Truesdale, L. Beckley, and C. Holton. 2016. *Comments and Corrections to: "The Emperor's Old Clothes: An Inconvenient Truth About Currently Accepted Vapor Intrusion Assessment Methods" and "Emperor's Old Clothes Revisited", Two Recent Editorials by Mark Kram.* Groundwater Monitoring and Remediation. DOI: 10.1111/gwmmr.12166. July 2016.

Michalski, P., Thompson, S., DeWolf, C.D., Nicholson, P., McAlary, T. A. 2012. *Case Study of Petroleum Hydrocarbon Vapor Fate and Transport beneath a Residential Community.* Poster presentation at the Eighth International Conference on Remediation of Chlorinated and Recalcitrant Compounds. Monterey, CA. May 2012.

Odenchantz, J.E., H. O'Neill, S.J. Steinmacher, J.D. Case, and P.C. Johnson. 2008. *Residential vapor-intrusion evaluation: Long-duration passive sampling vs. short-duration active sampling.* Remediation 18(4):49-54.

Odenchantz, J.E., S.C. Thornley, and H. O'Neill. 2009. *An evaluation of the performance of multiple passive diffusion devices for indoor air sampling of VOCs.* Remediation 19(4):63-72.

RAM Group of Gannet Fleming, Inc. 2013. Apex Access Database entitled Apex ProjectDatabase.mdb. November 12.

Roggemans, S., C.L. Bruce, P.C. Johnson, and R. L. Johnson. 2001. *Vadose Zone Natural Attenuation of Hydrocarbon Vapors: An Empirical Assessment of Soil-Gas Vertical Profile Data.* API Soil and Groundwater Technical Task Force Bulletin No. 15. American Petroleum Institute. Washington, DC. December 2001.

Thompson, S., Michalski, P., DeWolf, C.D., Pruis, J. 2012. A Case Study Using Traditional and Non-Traditional Lines of Evidence for a Vapor Intrusion Pathway Evaluation in a Fractured Bedrock Setting. Platform presentation at the 2012 Air and Waste Management Association Vapor Intrusion Conference. Denver, CO. October 2012.

Trihydro Corporation (Trihydro). 2013. *Final Dissolved Phase Investigation Work Plan, Hartford Petroleum Release Site, Hartford, Illinois.* August 2013.

- Trihydro. 2014a. *Final Interim In-Home Effectiveness Monitoring Plan, Hartford Petroleum Release Site, Hartford, Illinois*. January 2014.
- Trihydro. 2014b. *LNAPL Component to The Conceptual Site Model, Hartford Petroleum Release Site Hartford, Illinois*. May 2014.
- Trihydro. 2015a. *Vapor Collection System Operation, Maintenance, and Monitoring Plan, Hartford Petroleum Release Site, Hartford, Illinois*. September 2015.
- Trihydro. 2015b. *Semiannual Soil Vapor Extraction System Operations, Monitoring, and Maintenance Report, Hartford Petroleum Release Site Hartford, Illinois*. November 2015.
- United States Environmental Protection Agency (USEPA). 2008. *USEPA Engineering Issue: Indoor Air Vapor Intrusion Mitigation Approaches*. (EPA/600/R-08-115). October 2008.
- USEPA. 1996. *Region 1 Laboratory Data Validation Function Guidelines for Evaluation of Organic Analysis*. Office of Emergency and Remedial Response, Washington D.C. December 1996.
- USEPA. 1999a. *Compendium Method TO-17 (Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling onto Sorbent Tubes) from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*. January 1999.
- USEPA. 1999b. *Contract Laboratory Program National Functional Guidelines for Organic Data Review*. Office of Emergency and Remedial Response, Washington D.C. (EPA/540/R-99/008). October 1999.
- USEPA. 2008. *Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*. Office of Emergency and Remedial Response, Washington D.C. (EPA/540/R-08/01). June 2008.
- USEPA. 2010. *Innovations in Site Characterization, Streamlining Cleanup at Vapor Intrusion and Product Removal Sites Using the Triad Approach: Hartford Plume Site, Hartford Illinois*. September 2010.

- USEPA. 2012. *EPA's Vapor Intrusion Database: Evaluation and Characterization of Attenuation Factors for Chlorinated Volatile Organic Compounds and Residential Buildings*. Office of Solid Waste and Emergency Response, Washington, DC (EPA/530/R-10/002). March 2012.
- USEPA. 2015. *Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air*. Office of Solid Waste and Emergency Response, Washington, D.C. 9200.2-154. June 2015.
- USEPA. 2016. *Vapor Intrusion Screening Level (VISL) Calculator*. Available from: USEPA via the Internet: <https://www.epa.gov/vaporintrusion>. Assessed September 2016.
- URS Corporation. 2014a. *VCS Operations and Maintenance Manual, Hartford Working Group*. October 2014.
- URS Corporation. 2014b. *System Operation and Maintenance Response to River Rise, Groundwater Related and Sub-slab Triggers, Hartford Area Hydrocarbon Plume Site*. October 2014.
- URS Corporation. 2014c. *Effectiveness Monitoring Plan, Hartford Hydrocarbon Plume Site, Hartford, Illinois*. November 2014.

## TABLES

**TABLE 1. INTERIM IN-HOME MONITORING NETWORK**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Monitoring Frequency	Included in Event Based Monitoring	Mitigation Measures	Notes
107 W Birch	Weekly	Yes	Foundation Sealed, AllerAir Purifier	
117 W Birch	Weekly	Yes	Ventilation System	Monitoring suspended from April - May 2014 and July - September 2016 due to sanitary issues
119 W Date	Weekly	Yes	Ventilation System	
129 W Birch	Weekly	Yes	Foundation Sealed, AllerAir Purifier (2)	
504 N Delmar	Weekly	Yes	Ventilation System	
507 N Olive	Weekly	Yes	Sub-Slab Depressurization System, AllerAir Purifier	
516 N Delmar	Weekly	Yes	Ventilation System, AllerAir Purifier	
610 N Old St. Louis	Weekly	Yes	Foundation Sealed, AllerAir Purifier (2)	
715 N Delmar	Weekly	Yes	Ventilation System, AllerAir Purifier, Sub-Slab Vapor Extraction	
100 W Cherry	Quarterly	Yes	Foundation Sealed	
101 E Birch	Quarterly	Yes	Sub-Slab Depressurization System, AllerAir Purifier	
101 E Forest	Quarterly	Yes	Ventilation System	
101 E Watkins	Quarterly	No	Foundation Sealed	
102 E Date	Quarterly	No	Ventilation System	
102 W Date	Quarterly	Yes	Foundation Sealed	Structure vacated in December 2015, current occupancy status not determined
104 W Elm	Quarterly	Yes	Ventilation System	
107 W Forest	Quarterly	Yes	Ventilation System	
111 W Date	Quarterly	Yes	Foundation Sealed	
112 W Birch	Quarterly	Yes	Sub-Slab Depressurization System, AllerAir Purifier	Structure vacated in May 2016, current occupancy status not determined
114 E Forest	Quarterly	No	Ventilation System	
116 E Watkins	Quarterly	Yes	Ventilation System	
118 E Elm	Quarterly	Yes	Ventilation System	
118 W Birch	Quarterly	Yes	Foundation Sealed, AllerAir Purifier	
118 W Cherry	Quarterly	No	Ventilation System	

**TABLE 1. INTERIM IN-HOME MONITORING NETWORK**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Monitoring Frequency	Included in Event Based Monitoring	Mitigation Measures	Notes
118 W Elm	Quarterly	Yes	Foundation Sealed	
119 W Birch	Quarterly	Yes	Ventilation System	
119 W Cherry	Quarterly	Yes	Ventilation System	Weekly monitoring discontinued in July 2015; resident agreed to quarterly and event monitoring
122 W Cherry	Quarterly	No	Foundation Sealed	
122 W Date	Quarterly	No	Foundation Sealed	
122 W Watkins	Quarterly	Yes	Ventilation System	
123 E Elm	--	No	Foundation Sealed, AllerAir Purifier	Monitoring discontinued in November 2015 due to flea infestation
125 E Forest	Quarterly	Yes	Ventilation System	
125 W Birch	Quarterly	Yes	Ventilation System	Weekly monitoring discontinued in April 2015; resident agreed to quarterly and event monitoring
125 W Birch Rear	Quarterly	Yes	Ventilation System	Weekly monitoring discontinued in April 2015; resident agreed to quarterly and event monitoring
126 E Elm	Quarterly	No	Ventilation System	
127 E Elm	Quarterly	No	Foundation Sealed	
128 W Cherry	--	No	Ventilation System	Monitoring discontinued in August 2016 due to flea infestation
134 E Watkins	Quarterly	Yes	Sub-Slab Depressurization System, Ventilation System, Foundation Sealed	Added to monitoring network as replacement for 142 E Watkins in November 2015
138 W Forest	--	No	Ventilation System	Access denied since July 2011
142 E Watkins	--	--	Ventilation System	Monitoring suspended in November 2015 due to excess items/debris in basement
201 N Olive	Quarterly	Yes	Ventilation System	
309 N Olive	Quarterly	Yes	Ventilation System	
310 N Delmar	Quarterly	Yes	Ventilation System	
501 N Olive	Quarterly	Yes	Foundation Sealed	
518 N Delmar	Quarterly	Yes	AllerAir Purifier	
619 N Olive	Quarterly	Yes	Foundation Sealed	

**TABLE 2. CURRENT EFFECTIVENESS MONITORING NETWORK**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	Well Diameter (inches)	Well Plug / Ball Valve Replaced (Yes/No)	Well Details
MP-030A	Zone 1	N Olive	8.68	18.68	1.00	Yes	
MP-031A	Zone 1	A Clay	6.68	9.68	1.00	No	
MP-031B	Zone 1	N Olive	12.67	17.67	1.00	Yes	
MP-032A	Zone 1	N Olive	11.94	13.94	1.00	Yes	
MP-033B	Zone 1	N Olive	11.21	14.21	1.00	No	
MP-034A	Zone 1	N Olive	13.94	15.94	1.00	No	
MP-035A	Zone 1	A Clay	6.69	9.69	1.00	Yes	
MP-035B	Zone 1	N Olive	13.05	17.05	1.00	No	
MP-036A	Zone 1	N Olive	9.70	12.70	1.00	No	
MP-068	Zone 1	N Olive	9.56	16.66	1.00	Yes	
MP-078A	Zone 1	A Clay	6.05	8.05	1.00	Yes	
MP-078B	Zone 1	N Olive	11.45	13.45	1.00	Yes	
MP-079A	Zone 1	N Olive	12.50	16.90	1.00	No	
MP-080A	Zone 1	N Olive	7.86	18.46	1.00	No	
MP-083A	Zone 1	N Olive	12.64	15.34	1.00	Yes	
VMP-001S	Zone 1	A Clay	5.19	5.69	0.125	Yes	
VMP-002D	Zone 1	N Olive	12.73	13.23	0.125	Yes	
VMP-006S	Zone 1	N Olive	10.71	11.21	0.125	Yes	Well vault filled with dirt; well pad needs repair
VMP-007	Zone 1	N Olive	10.58	11.08	0.125	Yes	Well vault filled with dirt; well pad needs repair
VMP-021S	Zone 1	A Clay	9.50	10.00	0.125	No	Well paved over by the Village of Hartford
VMP-023M	Zone 1	N Olive	15.03	15.53	0.125	Yes	Well vault filled with dirt; well pad needs repair
VMP-023S	Zone 1	A Clay	5.05	5.55	0.125	Yes	Well vault filled with dirt; well pad needs repair
VMP-027M	Zone 1	B Clay	15.54	16.04	0.125	Yes	
VMP-027S	Zone 1	A Clay	9.54	10.04	0.125	Yes	
VMP-044S	Zone 1	N Olive	11.50	12.00	0.125	No	Well paved over by the Village of Hartford

**TABLE 2. CURRENT EFFECTIVENESS MONITORING NETWORK**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	Well Diameter (inches)	Well Plug / Ball Valve Replaced (Yes/No)	Well Details
VMP-044VS	Zone 1	A Clay	5.50	6.00	0.125	No	Well paved over by the Village of Hartford
VMP-052S	Zone 1	N Olive	12.00	12.50	0.125	Yes	
VMP-052VS	Zone 1	A Clay	6.51	7.01	0.125	Yes	
VMP-053S	Zone 1	N Olive	11.50	12.00	0.125	Yes	
VMP-053VS	Zone 1	A Clay	6.50	7.00	0.125	Yes	
VMP-057VS	Zone 1	A Clay	4.99	5.49	0.125	Yes	
VMP-058S	Zone 1	N Olive	11.50	12.00	0.125	Yes	
VMP-058VS	Zone 1	A Clay	4.50	5.00	0.125	Yes	
VMP-089S	Zone 1	N Olive	14.00	14.50	0.125	Yes	
VMP-089VS	Zone 1	A Clay	5.50	6.00	0.125	Yes	
MP-012S	Zone 2	A Clay	4.75	9.65	1.00	No	
MP-033A	Zone 2	A Clay	6.71	9.71	1.00	No	
MP-038A	Zone 2	N Olive	8.71	12.71	1.00	Yes	
MP-039A	Zone 2	N Olive	7.72	12.72	1.00	Yes	
MP-040A	Zone 2	A Clay	6.17	11.17	1.00	Yes	
MP-043A	Zone 2	N Olive	6.39	8.39	1.00	No	
MP-043B	Zone 2	Main Silt	12.16	17.16	1.00	Yes	
MP-048A	Zone 2	N Olive	8.92	18.92	1.00	No	
MP-049A	Zone 2	A Clay	6.19	11.19	1.00	Yes	
MP-084A	Zone 2	A Clay	5.64	8.44	1.00	Yes	
MP-087A	Zone 2	A Clay	5.56	6.56	1.00	Yes	
MP-090A	Zone 2	A Clay	5.04	5.54	0.125	Yes	
MP-090B	Zone 2	Main Silt	14.91	15.92	1.00	Yes	
MP-091B	Zone 2	Main Silt	13.44	14.44	1.00	Yes	
MP-112M	Zone 2	Main Silt	13.21	14.12	0.50	No	

**TABLE 2. CURRENT EFFECTIVENESS MONITORING NETWORK**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	Well Diameter (inches)	Well Plug / Ball Valve Replaced (Yes/No)	Well Details
MP-112S	Zone 2	N Olive	7.21	8.12	0.50	No	
MP-113M	Zone 2	Main Silt	13.05	13.96	0.50	No	
MP-113S	Zone 2	A Clay	7.05	7.96	0.50	No	
MP-114M	Zone 2	Main Silt	15.94	16.85	0.50	No	
MP-114S	Zone 2	A Clay	7.05	7.96	0.50	No	
MP-115S	Zone 2	N Olive	8.13	9.04	0.50	No	
VMP-037M	Zone 2	Rand	15.50	16.00	0.125	No	Well paved over by the Village of Hartford
VMP-037S	Zone 2	N Olive	7.50	8.00	0.125	No	Well paved over by the Village of Hartford
VMP-066M	Zone 2	Main Silt	16.99	17.49	0.125	Yes	
VMP-066S	Zone 2	N Olive	10.49	10.99	0.125	Yes	
VMP-066VS	Zone 2	A Clay	4.49	4.99	0.125	Yes	
VMP-067S	Zone 2	Main Silt	16.48	16.98	0.125	Yes	
VMP-067VS	Zone 2	A Clay	5.48	5.98	0.125	Yes	
MP-086A	Zone 3	A Clay	5.36	7.36	1.00	No	
VMP-073M	Zone 3	Main Silt	18.50	19.00	0.125	Yes	
VMP-073S	Zone 3	A Clay	7.50	8.00	0.125	Yes	
HMW-053A	Zone 4	N Olive	10.56	15.06	2.00	No	
HMW-054A	Zone 4	N Olive	10.39	14.89	2.00	Yes	
MP-016S	Zone 4	A Clay	4.73	9.63	1.00	Yes	
MP-022	Zone 4	A Clay	5.00	5.50	0.125	No	
MP-057A	Zone 4	N Olive	7.73	14.73	1.00	Yes	
MP-058A	Zone 4	A Clay	6.17	10.17	1.00	No	
MP-059A	Zone 4	A Clay	5.99	8.99	1.00	Yes	
MP-059B	Zone 4	Main Silt	12.40	18.40	1.00	Yes	
MP-060A	Zone 4	A Clay	5.68	9.68	1.00	No	

**TABLE 2. CURRENT EFFECTIVENESS MONITORING NETWORK**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	Well Diameter (inches)	Well Plug / Ball Valve Replaced (Yes/No)	Well Details
MP-064A	Zone 4	A Clay	5.72	9.72	1.00	Yes	
MP-088A	Zone 4	A Clay	5.22	9.42	1.00	Yes	
MP-088B	Zone 4	Main Silt	14.75	19.35	1.00	Yes	
MP-130M	Zone 4	N Olive	12.07	12.98	0.50	No	
MP-130S	Zone 4	N Olive	7.07	7.98	0.50	No	
VMP-026M	Zone 4	A Clay	14.52	15.02	0.125	Yes	
VMP-026S	Zone 4	A Clay	9.52	10.02	0.125	Yes	
VMP-074M	Zone 4	Main Silt	14.98	15.48	0.125	Yes	
VMP-074VS	Zone 4	A Clay	5.98	6.48	0.125	Yes	
VMP-078M	Zone 4	Main Silt	15.50	16.00	0.125	No	Well paved over by the Village of Hartford
VMP-080S	Zone 4	Main Silt	15.96	16.46	0.125	Yes	
VMP-080VS	Zone 4	A Clay	4.46	4.96	0.125	Yes	
VMP-081M	Zone 4	Main Silt	16.58	17.58	0.125	Yes	
VMP-081S	Zone 4	A Clay	13.08	13.58	0.125	Yes	
MP-044A	Zone 5	A Clay	6.72	9.72	1.00	Yes	
MP-044B	Zone 5	N Olive	12.70	14.70	1.00	Yes	
MP-045A	Zone 5	N Olive	8.76	12.76	1.00	No	
MP-046A	Zone 5	N Olive	8.72	14.72	1.00	Yes	
MP-047A	Zone 5	N Olive	8.17	14.17	1.00	Yes	
MP-050A	Zone 5	A Clay	6.60	14.60	1.00	Yes	
MP-051B	Zone 5	N Olive	13.19	15.19	1.00	Yes	
MP-052A	Zone 5	A Clay	6.17	10.17	1.00	Yes	
MP-053A	Zone 5	A Clay	6.67	11.67	1.00	Yes	
MP-054A	Zone 5	N Olive	7.56	12.56	1.00	Yes	
MP-055A	Zone 5	N Olive	6.97	16.97	1.00	Yes	

**TABLE 2. CURRENT EFFECTIVENESS MONITORING NETWORK**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	Well Diameter (inches)	Well Plug / Ball Valve Replaced (Yes/No)	Well Details
MP-056A	Zone 5	N Olive	6.18	11.18	1.00	Yes	
MP-128S	Zone 5	N Olive	9.06	9.97	0.50	No	
MP-129S	Zone 5	N Olive	11.13	12.04	0.50	No	
VMP-015M	Zone 5	B Clay	18.50	19.00	0.125	Yes	
VMP-015S	Zone 5	N Olive	12.00	12.50	0.125	Yes	
VMP-015VS	Zone 5	A Clay	5.50	6.00	0.125	Yes	
VMP-036S	Zone 5	B Clay	11.51	12.01	0.125	Yes	
VMP-036VS	Zone 5	A Clay	4.51	5.01	0.125	Yes	
VMP-065S	Zone 5	N Olive	10.96	11.46	0.125	Yes	
VMP-065VS	Zone 5	A Clay	4.46	4.96	0.125	Yes	
VMP-068S	Zone 5	Rand	17.50	18.00	0.125	Yes	
VMP-068VS	Zone 5	A Clay	5.50	6.00	0.125	Yes	
VMP-069M	Zone 5	Main Silt	13.50	14.00	0.125	Yes	
VMP-069VS	Zone 5	A Clay	5.50	6.00	0.125	Yes	
VMP-070M	Zone 5	Rand	19.49	19.99	0.125	Yes	
VMP-070VS	Zone 5	A Clay	4.49	4.99	0.125	Yes	
VMP-071S	Zone 5	N Olive	10.00	10.50	0.125	Yes	
VMP-071VS	Zone 5	A Clay	5.50	6.00	0.125	Yes	
VMP-075S	Zone 5	N Olive	13.00	13.50	0.125	Yes	
VMP-075VS	Zone 5	A Clay	5.00	5.50	0.125	Yes	
VMP-076S	Zone 5	N Olive	10.51	11.01	0.125	Yes	
VMP-076VS	Zone 5	A Clay	4.51	5.01	0.125	Yes	
VMP-093S	Zone 5	N Olive	9.51	10.01	0.125	Yes	
VMP-094S	Zone 5	N Olive	13.48	13.98	0.125	Yes	
VMP-094VS	Zone 5	A Clay	5.48	5.98	0.125	Yes	

**TABLE 2. CURRENT EFFECTIVENESS MONITORING NETWORK**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	Well Diameter (inches)	Well Plug / Ball Valve Replaced (Yes/No)	Well Details
MP-029A	Zone 6	N Olive	9.79	11.79	1.00	Yes	
MP-037A	Zone 6	N Olive	8.18	13.18	1.00	Yes	
MP-041A	Zone 6	N Olive	11.71	13.71	1.00	Yes	
MP-042A	Zone 6	N Olive	7.71	17.71	1.00	Yes	
MP-085A	Zone 6	N Olive	7.84	9.84	1.00	Yes	Bad seal at well plug due to crack at top of casing
MP-116S	Zone 6	N Olive	11.51	12.42	0.50	No	
MP-117S	Zone 6	N Olive	10.59	11.50	0.50	No	
MP-118S	Zone 6	N Olive	11.58	12.49	0.50	No	
MP-120S	Zone 6	N Olive	10.07	10.98	0.50	No	
MP-121S	Zone 6	N Olive	10.07	10.98	0.50	No	
MP-122S	Zone 6	N Olive	8.60	9.51	0.50	No	
MP-123S	Zone 6	N Olive	9.06	9.97	0.50	No	
MP-124M	Zone 6	N Olive	12.60	13.51	0.50	No	
MP-124S	Zone 6	N Olive	8.10	9.01	0.50	No	
MP-125S	Zone 6	N Olive	9.11	10.02	0.50	No	
MP-126M	Zone 6	N Olive	12.57	13.48	0.50	No	
MP-126S	Zone 6	N Olive	8.07	8.98	0.50	No	
MP-127D	Zone 6	Rand	19.06	19.97	0.50	No	
MP-127M	Zone 6	N Olive	11.56	12.47	0.50	No	Well leaks due to bad seal at quick connect fitting
MP-127S	Zone 6	N Olive	7.06	7.97	0.50	No	
VMP-012M	Zone 6	B Clay	14.50	15.00	0.125	No	Cannot connect ball valve; well vault needs repair
VMP-012S	Zone 6	N Olive	10.50	11.00	0.125	No	Cannot connect ball valve; well vault needs repair
VMP-062S	Zone 6	N Olive	9.00	9.50	0.125	No	Well paved over by the Village of Hartford
VMP-062VS	Zone 6	A Clay	4.00	4.50	0.125	No	Well paved over by the Village of Hartford
VMP-064M	Zone 6	N Olive	12.00	12.50	0.125	Yes	

**TABLE 2. CURRENT EFFECTIVENESS MONITORING NETWORK**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	Well Diameter (inches)	Well Plug / Ball Valve Replaced (Yes/No)	Well Details
VMP-064S	Zone 6	N Olive	8.00	8.50	0.125	Yes	
VMP-064VS	Zone 6	A Clay	4.50	5.00	0.125	Yes	
VMP-090VS	Zone 6	A Clay	5.48	5.98	0.125	Yes	
VP-004S	Zone 6	N Olive	11.79	12.29	0.125	Yes	Well vault filled with dirt; well pad needs repair

Notes

Well diameter as measured at ground surface

**TABLE 3. PROPOSED EFFECTIVENESS MONITORING NETWORK**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	Well Diameter (inches)	Well Plug / Ball Valve Replaced (Yes/No)	Monitoring Frequency	Well Details
MP-031A	Zone 1	A Clay	6.68	9.68	1.00	No	Monthly	
MP-031B	Zone 1	N Olive	12.67	17.67	1.00	Yes	Monthly	
MP-032A	Zone 1	N Olive	11.94	13.94	1.00	Yes	Monthly	
MP-033B	Zone 1	N Olive	11.21	14.21	1.00	No	Quarterly	
MP-034A	Zone 1	N Olive	13.94	15.94	1.00	No	Quarterly	
MP-035A	Zone 1	A Clay	6.69	9.69	1.00	Yes	Quarterly	
MP-035B	Zone 1	N Olive	13.05	17.05	1.00	No	Quarterly	
MP-036A	Zone 1	N Olive	9.70	12.70	1.00	No	Quarterly	
MP-068	Zone 1	N Olive	9.56	16.66	1.00	Yes	Quarterly	
MP-078A	Zone 1	A Clay	6.05	8.05	1.00	Yes	Monthly	
MP-078B	Zone 1	N Olive	11.45	13.45	1.00	Yes	Monthly	
MP-079A	Zone 1	N Olive	12.50	16.90	1.00	No	Monthly	
MP-083A	Zone 1	N Olive	12.64	15.34	1.00	Yes	Monthly	
VMP-001S	Zone 1	A Clay	5.19	5.69	0.125	Yes	Quarterly	
VMP-002D	Zone 1	N Olive	12.73	13.23	0.125	Yes	Monthly	
VMP-006S	Zone 1	N Olive	10.71	11.21	0.125	Yes	Monthly	Well vault filled with dirt; well pad needs repair
VMP-007	Zone 1	N Olive	10.58	11.08	0.125	Yes	Quarterly	Well vault filled with dirt; well pad needs repair
VMP-027S	Zone 1	A Clay	9.54	10.04	0.125	Yes	Monthly	
VMP-047S	Zone 1	N Olive	10.30	10.80	0.125	No	Monthly	Existing monitoring location added to network
VMP-052S	Zone 1	N Olive	12.00	12.50	0.125	Yes	Quarterly	
VMP-052VS	Zone 1	A Clay	6.51	7.01	0.125	Yes	Quarterly	
VMP-053S	Zone 1	N Olive	11.50	12.00	0.125	Yes	Monthly	
VMP-053VS	Zone 1	A Clay	6.50	7.00	0.125	Yes	Monthly	
VMP-057S	Zone 1	N Olive	12.99	13.49	0.125	No	Quarterly	Existing monitoring location added to network
VMP-058S	Zone 1	N Olive	11.50	12.00	0.125	Yes	Quarterly	

**TABLE 3. PROPOSED EFFECTIVENESS MONITORING NETWORK**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	Well Diameter (inches)	Well Plug / Ball Valve Replaced (Yes/No)	Monitoring Frequency	Well Details
VMP-089S	Zone 1	N Olive	14.00	14.50	0.125	Yes	Monthly	
VMP-089VS	Zone 1	A Clay	5.50	6.00	0.125	Yes	Monthly	
VMP-099VS	Zone 1	A Clay	5.58	6.08	0.125	No	Quarterly	Existing monitoring location added to network
VMP-113	Zone 1	N Olive	--	--	0.25	--	Monthly	Proposed additional monitoring location
VMP-114	Zone 1	N Olive	--	--	0.25	--	Quarterly	Proposed additional monitoring location
MP-033A	Zone 2	A Clay	6.71	9.71	1.00	No	Quarterly	
MP-038A	Zone 2	N Olive	8.71	12.71	1.00	Yes	Quarterly	
MP-039A	Zone 2	N Olive	7.72	12.72	1.00	Yes	Quarterly	
MP-040A	Zone 2	A Clay	6.17	11.17	1.00	Yes	Monthly	
MP-043A	Zone 2	N Olive	6.39	8.39	1.00	No	Monthly	
MP-049A	Zone 2	A Clay	6.19	11.19	1.00	Yes	Quarterly	
MP-084A	Zone 2	A Clay	5.64	8.44	1.00	Yes	Quarterly	
MP-087A	Zone 2	A Clay	5.56	6.56	1.00	Yes	Quarterly	
MP-090A	Zone 2	A Clay	6.52	7.02	0.125	Yes	Quarterly	
MP-091A	Zone 2	A Clay	6.13	6.63	0.125	No	Quarterly	Existing monitoring location added to network
VMP-039S	Zone 2	N Olive	7.51	8.01	0.125	No	Quarterly	Existing monitoring location added to network
VMP-066S	Zone 2	N Olive	10.49	10.99	0.125	Yes	Quarterly	
VMP-067VS	Zone 2	A Clay	5.48	5.98	0.125	Yes	Quarterly	
VMP-091S	Zone 2	A Clay	9.00	9.50	0.125	No	Quarterly	Existing monitoring location added to network
VMP-100VS	Zone 2	A Clay	5.91	6.41	0.125	No	Quarterly	Existing monitoring location added to network
MP-086A	Zone 3	A Clay	5.36	7.36	1.00	No	Quarterly	
VMP-073S	Zone 3	A Clay	7.50	8.00	0.125	Yes	Quarterly	
HMW-053A	Zone 4	N Olive	10.56	15.06	2.00	No	Quarterly	
HMW-054A	Zone 4	N Olive	10.39	14.89	2.00	Yes	Quarterly	
MP-015S	Zone 4	A Clay	4.73	9.63	1.00	No	Quarterly	Existing monitoring location added to network

**TABLE 3. PROPOSED EFFECTIVENESS MONITORING NETWORK**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	Well Diameter (inches)	Well Plug / Ball Valve Replaced (Yes/No)	Monitoring Frequency	Well Details
MP-017	Zone 4	A Clay	8.19	8.69	0.125	No	Quarterly	Existing monitoring location added to network
MP-022	Zone 4	A Clay	5.00	5.50	0.125	No	Quarterly	
MP-057A	Zone 4	N Olive	7.73	14.73	1.00	Yes	Quarterly	
MP-058A	Zone 4	A Clay	6.17	10.17	1.00	No	Quarterly	
MP-059A	Zone 4	A Clay	5.99	8.99	1.00	Yes	Quarterly	
MP-060A	Zone 4	A Clay	5.68	9.68	1.00	No	Quarterly	
MP-064A	Zone 4	A Clay	5.72	9.72	1.00	Yes	Quarterly	
MP-088A	Zone 4	A Clay	5.22	9.42	1.00	Yes	Quarterly	
VMP-026M	Zone 4	A Clay	14.52	15.02	0.125	Yes	Quarterly	
VMP-026S	Zone 4	A Clay	9.52	10.02	0.125	Yes	Quarterly	
VMP-074VS	Zone 4	A Clay	5.98	6.48	0.125	Yes	Quarterly	
VMP-081S	Zone 4	A Clay	13.08	13.58	0.125	Yes	Quarterly	
MP-044A	Zone 5	A Clay	6.72	9.72	1.00	Yes	Quarterly	
MP-044B	Zone 5	N Olive	12.70	14.70	1.00	Yes	Quarterly	
MP-045A	Zone 5	N Olive	8.76	12.76	1.00	No	Quarterly	
MP-046A	Zone 5	N Olive	8.72	14.72	1.00	Yes	Quarterly	
MP-047A	Zone 5	N Olive	8.17	14.17	1.00	Yes	Quarterly	
MP-050A	Zone 5	A Clay	6.60	14.60	1.00	Yes	Quarterly	
MP-051B	Zone 5	N Olive	13.19	15.19	1.00	Yes	Quarterly	
MP-052A	Zone 5	A Clay	6.17	10.17	1.00	Yes	Quarterly	
MP-053A	Zone 5	A Clay	6.67	11.67	1.00	Yes	Quarterly	
MP-054A	Zone 5	N Olive	7.56	12.56	1.00	Yes	Quarterly	
MP-056A	Zone 5	N Olive	6.18	11.18	1.00	Yes	Quarterly	
VMP-015S	Zone 5	N Olive	12.00	12.50	0.125	Yes	Quarterly	
VMP-015VS	Zone 5	A Clay	5.50	6.00	0.125	Yes	Quarterly	

**TABLE 3. PROPOSED EFFECTIVENESS MONITORING NETWORK**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	Well Diameter (inches)	Well Plug / Ball Valve Replaced (Yes/No)	Monitoring Frequency	Well Details
VMP-065S	Zone 5	N Olive	10.96	11.46	0.125	Yes	Quarterly	
VMP-068VS	Zone 5	A Clay	5.50	6.00	0.125	Yes	Quarterly	
VMP-069VS	Zone 5	A Clay	5.50	6.00	0.125	Yes	Quarterly	
VMP-071S	Zone 5	N Olive	10.00	10.50	0.125	Yes	Quarterly	
VMP-071VS	Zone 5	A Clay	5.50	6.00	0.125	Yes	Quarterly	
VMP-075S	Zone 5	N Olive	13.00	13.50	0.125	Yes	Quarterly	
VMP-075VS	Zone 5	A Clay	5.00	5.50	0.125	Yes	Quarterly	
VMP-076S	Zone 5	N Olive	10.51	11.01	0.125	Yes	Quarterly	
VMP-093S	Zone 5	N Olive	9.51	10.01	0.125	Yes	Quarterly	
VMP-094S	Zone 5	N Olive	13.48	13.98	0.125	Yes	Quarterly	
VMP-094VS	Zone 5	A Clay	5.48	5.98	0.125	Yes	Quarterly	
VMP-120	Zone 5	N Olive	--	--	0.25	--	Quarterly	Proposed additional monitoring location
HMW-048A	Zone 6	N Olive	6.00	14.70	2.00	No	Quarterly	Existing monitoring location added to network
MP-029A	Zone 6	N Olive	9.79	11.79	1.00	Yes	Monthly	
MP-037A	Zone 6	N Olive	8.18	13.18	1.00	Yes	Quarterly	
MP-041A	Zone 6	N Olive	11.71	13.71	1.00	Yes	Quarterly	
MP-085A	Zone 6	N Olive	7.84	9.84	1.00	Yes	Quarterly	Bad seal at well plug due to crack at top of casing
MP-106B	Zone 6	N Olive	9.50	13.51	1.00	No	Quarterly	Existing monitoring location added to network
MP-109B	Zone 6	N Olive	11.72	13.22	1.00	No	Quarterly	Existing monitoring location added to network
VMP-012S	Zone 6	N Olive	10.50	11.00	0.125	No	Quarterly	Cannot connect ball valve; well vault needs repair
VMP-064M	Zone 6	N Olive	12.00	12.50	0.125	Yes	Quarterly	
VMP-064S	Zone 6	N Olive	8.00	8.50	0.125	Yes	Quarterly	
VMP-090VS	Zone 6	A Clay	5.48	5.98	0.125	Yes	Quarterly	
VMP-106	Zone 6	N Olive	--	--	0.25	--	Quarterly	Proposed additional monitoring location
VMP-107	Zone 6	N Olive	--	--	0.25	--	Monthly	Proposed additional monitoring location

**TABLE 3. PROPOSED EFFECTIVENESS MONITORING NETWORK**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	Well Diameter (inches)	Well Plug / Ball Valve Replaced (Yes/No)	Monitoring Frequency	Well Details
VMP-108	Zone 6	N Olive	--	--	0.25	--	Quarterly	Proposed additional monitoring location
VMP-109	Zone 6	N Olive	--	--	0.25	--	Quarterly	Proposed additional monitoring location
VMP-110	Zone 6	N Olive	--	--	0.25	--	Quarterly	Proposed additional monitoring location
VMP-111	Zone 6	N Olive	--	--	0.25	--	Quarterly	Proposed additional monitoring location
VMP-112	Zone 6	N Olive	--	--	0.25	--	Quarterly	Proposed additional monitoring location
VMP-115	Zone 6	N Olive	--	--	0.25	--	Monthly	Proposed additional monitoring location
VMP-116	Zone 6	N Olive	--	--	0.25	--	Monthly	Proposed additional monitoring location
VMP-117	Zone 6	N Olive	--	--	0.25	--	Quarterly	Proposed additional monitoring location
VMP-118	Zone 6	N Olive	--	--	0.25	--	Quarterly	Proposed additional monitoring location
VMP-119	Zone 6	N Olive	--	--	0.25	--	Quarterly	Proposed additional monitoring location
VP-003	Zone 6	N Olive	10.86	11.36	0.125	No	Monthly	Existing monitoring location added to network
VP-004S	Zone 6	N Olive	11.79	12.29	0.125	Yes	Monthly	Well vault filled with dirt; well pad needs repair

Notes

Well diameter as measured at ground surface

-- Construction details to be defined during vapor monitoring probe installation

**TABLE 4. MONITORING LOCATIONS WITH 10-FEET OR MORE OF EXPOSED SCREEN**  
HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS

Location	Effectiveness Zone	Subsurface Layer	2016Q3								2016Q2					
			Top of Screen	Bottom of Screen	Static Pressure/ Vacuum	Estimated Soil Gas Permeability	Oxygen	TVPH	DTW / Deadhead	Exposed Screen Length	Static Pressure/ Vacuum	Estimated Soil Gas Permeability	Oxygen	TVPH	DTW / Deadhead	Exposed Screen Length
			(ft-bmp)	(ft-bmp)	(in-H2O)	(cm2)	(%)	(ppmv)	(ft-bmp)	(feet)	(in-H2O)	(cm2)	(%)	(ppmv)	(ft-bmp)	(feet)
MP-030A	Zone 1	N Olive	8.68	18.68	0.05	4.21E-09	3.10	611	18.52	9.84	--	--	3.5	160.00	DRY	10.00
MP-042A	Zone 6	N Olive	7.71	17.71	0.05	5.07E-09	2.30	279	DRY	10.00	--	--	6.50	0.00	14.63	6.92
MP-048A	Zone 2	N Olive	8.92	18.92	0.20	5.87E-09	11.8	277	DRY	10.00	--	--	14.7	18.0	DRY	10.00
MP-055A	Zone 5	N Olive	6.97	16.97	0.44	2.83E-09	0.50	654,000	DRY	10.00	--	--	0.2	426,000	DRY	10.00
MP-080A	Zone 1	N Olive	7.86	18.46	-0.07	3.76E-09	20.1	77.8	DRY	10.60	--	--	15.8	0.00	DRY	10.60

Location	Effectiveness Zone	Subsurface Layer	2016Q1								2015Q4					
			Top of Screen	Bottom of Screen	Static Pressure/ Vacuum	Estimated Soil Gas Permeability	Oxygen	TVPH	DTW / Deadhead	Exposed Screen Length	Static Pressure/ Vacuum	Estimated Soil Gas Permeability	Oxygen	TVPH	DTW / Deadhead	Exposed Screen Length
			(ft-bmp)	(ft-bmp)	(in-H2O)	(cm2)	(%)	(ppmv)	(ft-bmp)	(feet)	(in-H2O)	(cm2)	(%)	(ppmv)	(ft-bmp)	(feet)
MP-030A	Zone 1	N Olive	8.68	18.68	0.00	3.98E-09	12.5	0.00	DRY	10.00	0.00	3.96E-09	15.9	0.00	DRY	10.00
MP-042A	Zone 6	N Olive	7.71	17.71	-0.19	4.77E-09	2.80	0.00	17.35	9.64	0.00	1.20E-08	10.0	40.0	DRY	10.00
MP-048A	Zone 2	N Olive	8.92	18.92	0.00	5.33E-09	13.4	155	DRY	10.00	0.00	9.62E-09	16.7	9.00	DRY	10.00
MP-055A	Zone 5	N Olive	6.97	16.97	0.00	3.29E-09	10.9	54,550	DRY	10.00	0.00	1.67E-09	0.20	73,000	DRY	10.00
MP-080A	Zone 1	N Olive	7.86	18.46	0.00	3.99E-09	20.9	3.00	18.27	10.41	-0.35	4.15E-09	20.3	0.00	DRY	10.60

Location	Effectiveness Zone	Subsurface Layer	2015Q3								2015Q2					
			Top of Screen	Bottom of Screen	Static Pressure/ Vacuum	Estimated Soil Gas Permeability	Oxygen	TVPH	DTW / Deadhead	Exposed Screen Length	Static Pressure/ Vacuum	Estimated Soil Gas Permeability	Oxygen	TVPH	DTW / Deadhead	Exposed Screen Length
			(ft-bmp)	(ft-bmp)	(in-H2O)	(cm2)	(%)	(ppmv)	(ft-bmp)	(feet)	(in-H2O)	(cm2)	(%)	(ppmv)	(ft-bmp)	(feet)
MP-030A	Zone 1	N Olive	8.68	18.68	0.00	7.05E-09	4.90	128	DRY	10.00	0.00	3.88E-09	15.7	18.0	DRY	10.00
MP-042A	Zone 6	N Olive	7.71	17.71	0.00	1.06E-08	4.40	0.00	DRY	10.00	0.00	4.14E-09	14.4	0.00	16.93	9.22
MP-048A	Zone 2	N Olive	8.92	18.92	0.00	1.06E-08	12.6	0.00	DRY	10.00	0.00	4.18E-09	18.3	8.54	DRY	10.00
MP-055A	Zone 5	N Olive	6.97	16.97	0.00	1.46E-09	1.30	53,000	DRY	10.00	0.00	3.77E-09	20.3	33.7	16.88	9.91
MP-080A	Zone 1	N Olive	7.86	18.46	-0.35	4.60E-09	17.9	12,500	DRY	10.60	-0.77	1.25E-09	19.2	13,500	DRY	10.60

Notes:  
- MP-085A top of well casing is cracked where well cap is located  
- MP-127M leaks at the quick-connect fitting

**TABLE 5. MONITORING LOCATIONS WITH ELEVATED CONCENTRATIONS OF TOTAL VOLATILE PETROLEUM HYDROCARBONS AND OXYGEN**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	2016Q3								2016Q2					
			Top of Screen	Bottom of Screen	Static Pressure/ Vacuum	Estimated Soil Gas Permeability	Oxygen	TVPH	DTW / Deadhead	Exposed Screen Length	Static Pressure/ Vacuum	Estimated Soil Gas Permeability	Oxygen	TVPH	DTW / Deadhead	Exposed Screen Length
			(ft-bmp)	(ft-bmp)	(in-H2O)	(cm2)	(%)	(ppmv)	(ft-bmp)	(feet)	(in-H2O)	(cm2)	(%)	(ppmv)	(ft-bmp)	(feet)
HMW-053A	Zone 4	N Olive	10.56	15.06	-0.44	2.44E-09	13.6	0.00	15.55	4.50	--	--	15.4	0.00	15.59	4.50
HMW-054A	Zone 4	N Olive	10.39	14.89	0.04	3.33E-09	5.20	0.00	15.56	4.50	--	--	15.20	0.00	15.48	4.50
MP-012S	Zone 2	A Clay	4.75	9.65	0.16	8.50E-09	15.1	0.00	DRY	4.90	--	--	19.0	120	DRY	4.90
MP-016S	Zone 4	A Clay	4.73	9.63	0.32	4.66E-09	6.50	0.00	9.36	4.63	--	--	19.6	4.70	9.33	4.60
MP-031A	Zone 1	A Clay	6.68	9.68	0.00	6.66E-09	14.2	0.00	DRY	3.00	--	--	18.1	230	DRY	3.00
MP-031B	Zone 1	N Olive	12.67	17.67	0.00	1.31E-08	14.3	0.00	14.43	1.76	--	--	18.1	255	14.58	1.91
MP-033A	Zone 2	A Clay	6.71	9.71	-1.37	1.62E-08	19.4	204	DRY	3.00	--	--	19.6	61.0	DRY	3.00
MP-033B	Zone 1	N Olive	11.21	14.21	-1.75	3.02E-09	3.40	1,827,000	DRY	3.00	--	--	0.70	150,000	DRY	3.00
MP-034A	Zone 1	N Olive	13.94	15.94	0.00	1.45E-09	18.1	883	15.68	1.74	--	--	16.7	424	15.41	1.47
MP-039A	Zone 2	N Olive	7.72	12.72	0.00	6.66E-09	13.2	52.2	DRY	5.00	--	--	17.0	108	DRY	5.00
MP-044B	Zone 5	N Olive	12.70	14.70	-0.38	5.30E-09	18.2	748	DRY	2.00	--	--	20.5	23.5	DRY	2.00
MP-047A	Zone 5	N Olive	8.17	14.17	-0.61	3.45E-09	17.4	16.8	DRY	6.00	--	--	15.8	24.0	DRY	6.00
MP-048A	Zone 2	N Olive	8.92	18.92	0.20	5.87E-09	11.8	277	DRY	10.00	--	--	14.7	18.0	DRY	10.00
MP-055A	Zone 5	N Olive	6.97	16.97	0.44	2.83E-09	0.50	654,000	DRY	10.00	--	--	0.20	426,000	DRY	10.00
MP-056A	Zone 5	N Olive	6.18	11.18	0.28	6.45E-09	14.2	198	DRY	5.00	--	--	17.5	9.50	DRY	5.00
MP-078B	Zone 1	N Olive	11.45	13.45	0.03	2.78E-08	18.5	3.20	DRY	2.00	--	--	18.7	7.00	DRY	2.00
MP-080A	Zone 1	N Olive	7.86	18.46	-0.07	3.76E-09	20.1	77.8	DRY	10.60	--	--	15.8	0.00	DRY	10.60
MP-084A	Zone 2	A Clay	5.64	8.44	0.02	9.59E-09	19.7	4.70	DRY	2.80	--	--	20.7	5.50	DRY	2.80
MP-090A	Zone 2	A Clay	6.52	7.02	0.42	3.20E-08	20.5	50.5	--	--	--	--	20.9	13.0	--	--
MP-113S	Zone 2	A Clay	7.05	7.96	-1.11	1.52E-08	20.7	18.5	--	--	--	--	20.7	23.0	--	--
MP-114S	Zone 2	A Clay	7.05	7.96	-0.03	1.86E-08	18.6	33.7	--	--	--	--	20.0	8.00	--	--
MP-116S	Zone 6	N Olive	11.51	12.42	0.12	--	--	--	--	--	--	--	6.50	82,060	--	--
MP-117S	Zone 6	N Olive	10.59	11.50	-0.56	--	--	--	--	--	--	--	--	--	--	--
MP-118S	Zone 6	N Olive	11.58	12.49	-0.99	--	--	--	--	--	--	--	20.7	575	--	--
MP-120S	Zone 6	N Olive	10.07	10.98	-1.65	--	--	--	--	--	--	--	--	--	--	--
MP-121S	Zone 6	N Olive	10.07	10.98	0.13	--	--	--	--	--	--	--	6.00	25,500	--	--
MP-122S	Zone 6	N Olive	8.60	9.51	-14.51	--	--	--	--	--	--	--	20.7	36.0	--	--
MP-123S	Zone 6	N Olive	9.06	9.97	-0.33	1.16E-08	6.70	239	--	--	--	--	--	--	--	--
MP-124M	Zone 6	N Olive	12.60	13.51	-0.89	--	--	--	--	--	--	--	--	--	--	--
MP-124S	Zone 6	N Olive	8.10	9.01	-0.23	4.93E-09	11.2	80.0	--	--	--	--	18.9	26.0	--	--
MP-125S	Zone 6	N Olive	9.11	10.02	0.02	1.76E-08	2.60	118	--	--	--	--	5.40	30.0	--	--
MP-126S	Zone 6	N Olive	8.07	8.98	-0.16	6.17E-09	4.50	345	--	--	--	--	18.9	23,000	--	--
MP-127M	Zone 6	N Olive	11.56	12.47	0.10	1.43E-08	--	--	--	--	--	--	15.9	10.0	--	--
MP-127S	Zone 6	N Olive	7.06	7.97	-0.07	1.38E-08	18.5	41.5	--	--	--	--	19.2	5.60	--	--
MP-128S	Zone 5	N Olive	9.06	9.97	0.00	1.78E-08	12.1	63.5	--	--	--	--	16.8	24.0	--	--
MP-129S	Zone 5	N Olive	11.13	12.04	-0.20	8.66E-09	5.10	44.0	--	--	--	--	15.7	23.0	--	--
MP-130M	Zone 4	N Olive	12.07	12.98	-0.57	1.54E-08	15.6	96.0	--	--	--	--	18.7	9.00	--	--
MP-130S	Zone 4	N Olive	7.07	7.98	-0.59	1.29E-08	18.6	49.1	--	--	--	--	20.4	14.0	--	--

**TABLE 5. MONITORING LOCATIONS WITH ELEVATED CONCENTRATIONS OF TOTAL VOLATILE PETROLEUM HYDROCARBONS AND OXYGEN**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	2016Q1								2015Q4					
			Top of Screen	Bottom of Screen	Static Pressure/ Vacuum	Estimated Soil Gas Permeability	Oxygen	TVPH	DTW / Deadhead	Exposed Screen Length	Static Pressure/ Vacuum	Estimated Soil Gas Permeability	Oxygen	TVPH	DTW / Deadhead	Exposed Screen Length
			(ft-bmp)	(ft-bmp)	(in-H2O)	(cm2)	(%)	(ppmv)	(ft-bmp)	(feet)	(in-H2O)	(cm2)	(%)	(ppmv)	(ft-bmp)	(feet)
HMW-053A	Zone 4	N Olive	10.56	15.06	-0.42	4.71E-09	19.9	0.00	15.57	4.50	-0.83	3.65E-09	16.1	370	15.58	4.50
HMW-054A	Zone 4	N Olive	10.39	14.89	0.00	5.56E-09	5.30	180	15.48	4.50	0.00	5.04E-09	14.0	18.0	15.63	4.50
MP-012S	Zone 2	A Clay	4.75	9.65	0.00	1.08E-08	20.8	0.00	DRY	4.90	0.00	1.12E-08	18.2	30.0	DRY	4.90
MP-016S	Zone 4	A Clay	4.73	9.63	0.00	8.28E-09	19.9	0.00	9.34	4.61	0.00	9.71E-09	16.1	0.00	9.26	4.53
MP-031A	Zone 1	A Clay	6.68	9.68	0.00	6.39E-09	18.7	10.5	DRY	3.00	0.00	7.67E-09	16.3	14.4	DRY	3.00
MP-031B	Zone 1	N Olive	12.67	17.67	0.00	9.50E-09	17.3	72.0	14.34	1.67	--	--	--	--	--	--
MP-033A	Zone 2	A Clay	6.71	9.71	-0.62	1.01E-08	20.4	72.5	DRY	3.00	-2.57	2.23E-08	20.2	5.00	DRY	3.00
MP-033B	Zone 1	N Olive	11.21	14.21	-0.66	2.73E-09	3.30	1,664,000	DRY	3.00	-1.28	3.58E-09	0.70	1,670,000	14.16	2.95
MP-034A	Zone 1	N Olive	13.94	15.94	0.00	7.29E-09	20.6	27.0	DRY	2.00	0.00	2.04E-09	19.5	7.00	15.57	1.63
MP-039A	Zone 2	N Olive	7.72	12.72	0.00	1.01E-08	17.9	40.0	DRY	5.00	0.00	2.05E-08	15.8	25.0	DRY	5.00
MP-044B	Zone 5	N Olive	12.70	14.70	-0.91	1.16E-08	20.9	0.00	DRY	2.00	-0.89	6.64E-09	20.4	17.0	DRY	2.00
MP-047A	Zone 5	N Olive	8.17	14.17	-0.33	3.35E-09	17.4	6.50	DRY	6.00	0.00	3.59E-09	13.6	10.0	DRY	6.00
MP-048A	Zone 2	N Olive	8.92	18.92	0.00	5.33E-09	13.4	155	DRY	10.00	0.00	9.62E-09	16.7	9.00	DRY	10.00
MP-055A	Zone 5	N Olive	6.97	16.97	0.00	3.29E-09	10.9	54,550	DRY	10.00	0.00	1.67E-09	0.20	73,000	DRY	10.00
MP-056A	Zone 5	N Olive	6.18	11.18	0.00	8.22E-09	19.9	0.00	DRY	5.00	0.00	1.27E-08	17.6	7.00	DRY	5.00
MP-078B	Zone 1	N Olive	11.45	13.45	-0.60	2.21E-08	20.8	0.00	DRY	2.00	0.00	6.63E-09	20.9	17.1	DRY	2.00
MP-080A	Zone 1	N Olive	7.86	18.46	0.00	3.99E-09	20.9	3.00	18.27	10.41	-0.35	4.15E-09	20.3	0.00	DRY	10.60
MP-084A	Zone 2	A Clay	5.64	8.44	-1.64	1.48E-08	20.9	0.00	DRY	2.80	-0.60	1.15E-08	20.5	10.0	DRY	2.80
MP-090A	Zone 2	A Clay	6.52	7.02	-2.03	1.97E-08	20.8	0.00	--	--	-0.49	6.19E-09	20.8	8.00	--	--
MP-113S	Zone 2	A Clay	7.05	7.96	-0.75	3.03E-08	20.9	0.00	--	--	-0.40	8.68E-09	20.6	7.00	--	--
MP-114S	Zone 2	A Clay	7.05	7.96	0.00	2.77E-08	20.9	0.00	--	--	-0.28	1.74E-08	20.0	22.0	--	--
MP-116S	Zone 6	N Olive	11.51	12.42	0.00	1.05E-09	--	--	--	--	0.00	3.60E-09	4.90	160,000	--	--
MP-117S	Zone 6	N Olive	10.59	11.50	0.07	--	--	--	--	--	0.00	5.30E-09	0.90	185,000	--	--
MP-118S	Zone 6	N Olive	11.58	12.49	0.07	1.90E-09	--	--	--	--	0.00	2.75E-09	11.0	75,000	--	--
MP-120S	Zone 6	N Olive	10.07	10.98	-1.24	--	--	--	--	--	0.00	5.31E-09	11.3	150,000	--	--
MP-121S	Zone 6	N Olive	10.07	10.98	0.00	1.77E-08	--	--	--	--	0.00	6.14E-09	13.8	13,500	--	--
MP-122S	Zone 6	N Olive	8.60	9.51	0.00	3.92E-09	20.9	136	--	--	0.00	3.85E-08	18.0	13.0	--	--
MP-123S	Zone 6	N Olive	9.06	9.97	0.00	3.94E-09	20.9	154	--	--	-0.08	7.48E-08	18.2	8.00	--	--
MP-124M	Zone 6	N Olive	12.60	13.51	0.06	--	--	--	--	--	0.00	7.15E-09	20.2	18.0	--	--
MP-124S	Zone 6	N Olive	8.10	9.01	0.08	--	--	--	--	--	-0.09	5.49E-09	14.1	0.00	--	--
MP-125S	Zone 6	N Olive	9.11	10.02	0.00	1.67E-08	11.8	55.0	--	--	0.00	1.23E-08	11.6	13.0	--	--
MP-126S	Zone 6	N Olive	8.07	8.98	-0.08	2.41E-08	19.6	19,000	--	--	-0.06	3.42E-09	17.3	4.00	--	--
MP-127M	Zone 6	N Olive	11.56	12.47	0.00	2.49E-08	16.1	587	--	--	-0.11	6.19E-09	16.9	8.00	--	--
MP-127S	Zone 6	N Olive	7.06	7.97	0.00	2.43E-08	18.9	350	--	--	-0.06	8.36E-09	18.8	7.00	--	--
MP-128S	Zone 5	N Olive	9.06	9.97	0.00	1.65E-08	17.7	65.5	--	--	0.00	2.01E-08	16.4	1.00	--	--
MP-129S	Zone 5	N Olive	11.13	12.04	0.00	2.36E-08	11.9	50.0	--	--	-0.14	6.14E-09	18.6	5.00	--	--
MP-130M	Zone 4	N Olive	12.07	12.98	0.00	1.24E-08	13.7	35.0	--	--	-4.59	1.34E-08	11.3	0.00	--	--
MP-130S	Zone 4	N Olive	7.07	7.98	0.00	2.43E-08	19.2	36.5	--	--	-0.17	4.96E-09	18.6	4.00	--	--

**TABLE 5. MONITORING LOCATIONS WITH ELEVATED CONCENTRATIONS OF TOTAL VOLATILE PETROLEUM HYDROCARBONS AND OXYGEN**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

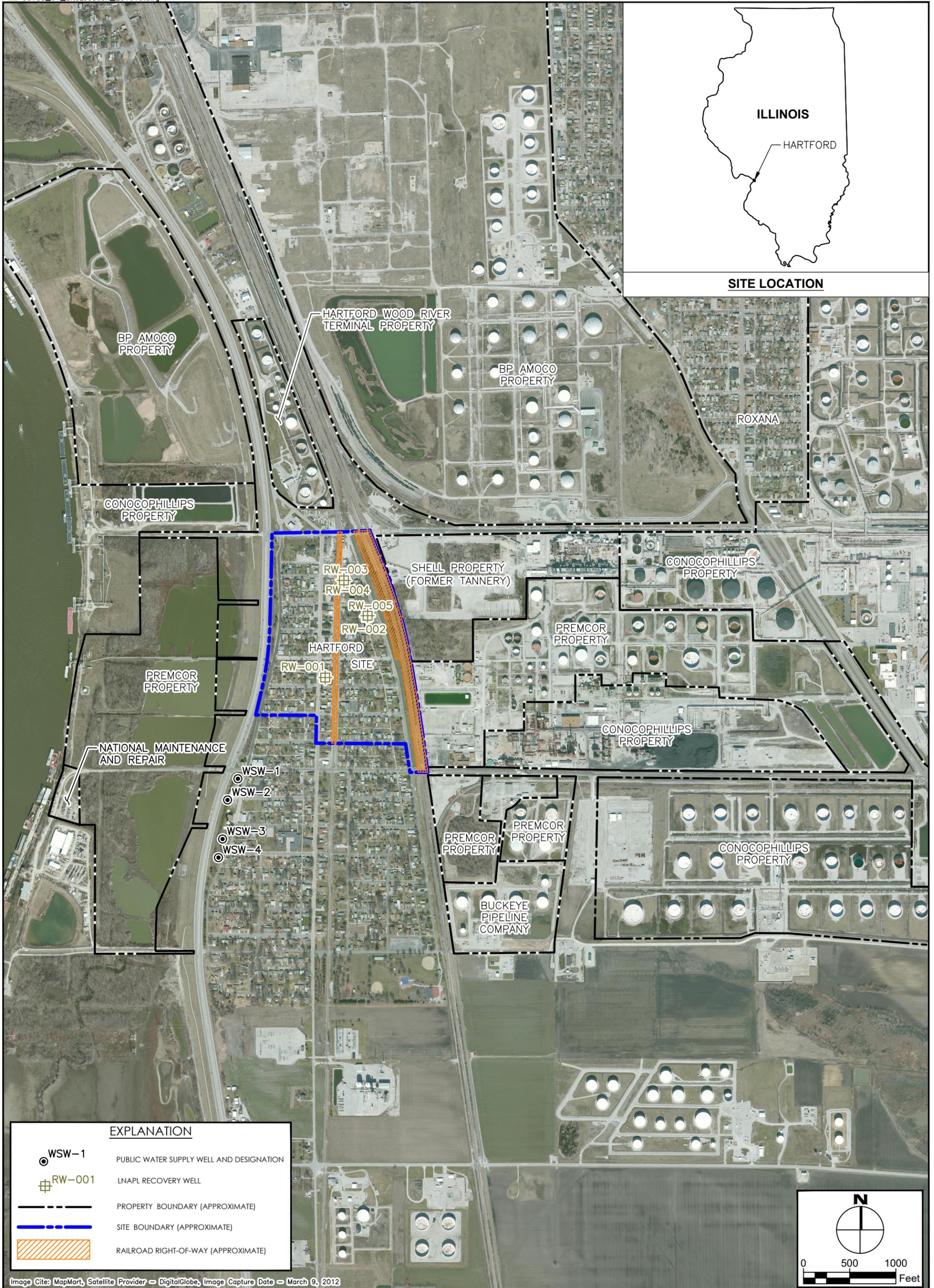
Location	Effectiveness Zone	Subsurface Layer	2015Q3								2015Q2					
			Top of Screen	Bottom of Screen	Static Pressure/ Vacuum	Estimated Soil Gas Permeability	Oxygen	TVPH	DTW / Deadhead	Exposed Screen Length	Static Pressure/ Vacuum	Estimated Soil Gas Permeability	Oxygen	TVPH	DTW / Deadhead	Exposed Screen Length
			(ft-bmp)	(ft-bmp)	(in-H2O)	(cm2)	(%)	(ppmv)	(ft-bmp)	(feet)	(in-H2O)	(cm2)	(%)	(ppmv)	(ft-bmp)	(feet)
HMW-053A	Zone 4	N Olive	10.56	15.06	-1.55	5.15E-09	15.6	57.4	15.55	4.50	-0.93	2.09E-09	19.2	88.1	DRY	4.50
HMW-054A	Zone 4	N Olive	10.39	14.89	-1.32	6.45E-09	11.4	460	15.64	4.50	-1.31	2.95E-09	19.3	103	15.64	4.50
MP-012S	Zone 2	A Clay	4.75	9.65	0.05	1.44E-08	14.1	32.7	DRY	4.90	0.00	7.91E-09	19.2	7.54	DRY	4.90
MP-016S	Zone 4	A Clay	4.73	9.63	0.00	4.14E-09	10.4	0.00	DRY	4.90	0.00	6.21E-09	18.7	118	9.41	4.68
MP-031A	Zone 1	A Clay	6.68	9.68	0.00	8.77E-09	13.3	4,950	DRY	3.00	0.00	8.40E-09	17.9	318	DRY	3.00
MP-031B	Zone 1	N Olive	12.67	17.67	0.00	5.74E-09	14.0	500	DRY	5.00	0.00	1.23E-08	18.5	96.9	14.46	1.79
MP-033A	Zone 2	A Clay	6.71	9.71	-0.27	1.76E-08	17.9	253	DRY	3.00	-0.06	1.10E-08	14.0	18,500	DRY	3.00
MP-033B	Zone 1	N Olive	11.21	14.21	-0.22	8.77E-09	20.3	2,137	DRY	3.00	0.00	1.18E-08	1.60	480,000	DRY	3.00
MP-034A	Zone 1	N Olive	13.94	15.94	0.00	6.96E-09	18.5	42.9	DRY	2.00	0.00	9.56E-09	19.9	11.8	DRY	2.00
MP-039A	Zone 2	N Olive	7.72	12.72	0.00	1.41E-08	12.0	14.1	DRY	5.00	0.00	9.94E-09	16.6	5.78	DRY	5.00
MP-044B	Zone 5	N Olive	12.70	14.70	-0.85	9.99E-09	20.4	14.3	DRY	2.00	-0.30	5.14E-09	20.6	7.26	DRY	2.00
MP-047A	Zone 5	N Olive	8.17	14.17	0.00	7.77E-10	19.1	500	DRY	6.00	0.00	3.23E-09	20.1	21.1	DRY	6.00
MP-048A	Zone 2	N Olive	8.92	18.92	0.00	1.06E-08	12.6	0.00	DRY	10.00	0.00	4.18E-09	18.3	8.54	DRY	10.00
MP-055A	Zone 5	N Olive	6.97	16.97	0.00	1.46E-09	1.30	53,000	DRY	10.00	0.00	3.77E-09	20.3	33.7	16.88	9.91
MP-056A	Zone 5	N Olive	6.18	11.18	0.00	1.59E-08	13.6	8,150	DRY	5.00	0.00	8.15E-09	17.7	6,359	DRY	5.00
MP-078B	Zone 1	N Olive	11.45	13.45	-0.39	3.97E-08	19.5	3.48	DRY	2.00	-0.79	2.41E-08	20.0	279	DRY	2.00
MP-080A	Zone 1	N Olive	7.86	18.46	-0.35	4.60E-09	17.9	12,500	DRY	10.60	-0.77	1.25E-09	19.2	13,500	DRY	10.60
MP-084A	Zone 2	A Clay	5.64	8.44	0.00	1.19E-08	19.9	1,576	DRY	2.80	-0.37	5.29E-09	19.6	16.5	DRY	2.80
MP-090A	Zone 2	A Clay	6.52	7.02	-1.99	2.52E-08	20.8	1,500	--	--	-0.45	9.56E-09	20.7	4.92	--	--
MP-113S	Zone 2	A Clay	7.05	7.96	0.00	1.30E-08	20.6	0.00	--	--	-0.33	1.11E-08	20.6	172	--	--
MP-114S	Zone 2	A Clay	7.05	7.96	0.00	2.12E-08	17.5	91.5	--	--	-0.19	1.48E-08	19.7	651	--	--
MP-116S	Zone 6	N Olive	11.51	12.42	0.00	3.50E-09	15.7	23,000	--	--	0.00	2.44E-09	13.2	34,000	--	--
MP-117S	Zone 6	N Olive	10.59	11.50	0.33	--	--	--	--	--	0.00	9.24E-10	13.6	39,000	--	--
MP-118S	Zone 6	N Olive	11.58	12.49	0.00	--	--	--	--	--	0.00	1.17E-09	19.1	2,200	--	--
MP-120S	Zone 6	N Olive	10.07	10.98	-0.65	--	--	--	--	--	0.00	1.12E-09	11.1	145,000	--	--
MP-121S	Zone 6	N Olive	10.07	10.98	0.00	9.65E-09	11.0	128,000	--	--	0.00	2.65E-09	19.9	392	--	--
MP-122S	Zone 6	N Olive	8.60	9.51	0.00	3.03E-08	14.7	2,130	--	--	-1.27	2.25E-09	20.4	192	--	--
MP-123S	Zone 6	N Olive	9.06	9.97	0.00	4.94E-08	10.7	26.4	--	--	-0.75	3.22E-09	19.7	159	--	--
MP-124M	Zone 6	N Olive	12.60	13.51	0.00	--	--	--	--	--	0.07	1.00E-09	20.2	117	--	--
MP-124S	Zone 6	N Olive	8.10	9.01	0.00	9.65E-09	15.1	94.9	--	--	0.00	2.02E-09	19.1	155	--	--
MP-125S	Zone 6	N Olive	9.11	10.02	0.00	2.31E-08	9.60	13.0	--	--	0.00	2.36E-09	19.1	1,600	--	--
MP-126S	Zone 6	N Olive	8.07	8.98	0.00	9.65E-09	13.8	33.0	--	--	-0.77	2.90E-09	20.7	109	--	--
MP-127M	Zone 6	N Olive	11.56	12.47	-0.12	2.01E-08	15.9	337	--	--	-0.13	2.50E-09	14.4	77.2	--	--
MP-127S	Zone 6	N Olive	7.06	7.97	0.00	1.59E-08	17.3	46.1	--	--	0.00	2.90E-09	18.1	226	--	--
MP-128S	Zone 5	N Olive	9.06	9.97	0.00	3.59E-08	10.6	16.4	--	--	0.00	2.80E-09	16.3	15,400	--	--
MP-129S	Zone 5	N Olive	11.13	12.04	-0.28	1.30E-08	11.5	508	--	--	0.00	3.04E-09	18.8	893	--	--
MP-130M	Zone 4	N Olive	12.07	12.98	-4.80	2.46E-08	17.9	4.66	--	--	-4.26	2.39E-09	20.6	485	--	--
MP-130S	Zone 4	N Olive	7.07	7.98	-0.65	6.72E-09	19.7	10.7	--	--	-0.14	2.72E-09	20.6	384	--	--

Notes:  
 - MP-085A top of well casing is cracked where well cap is located  
 - MP-127M leaks at the quick-connect fitting

**TABLE 6. STAKEHOLDER CONTACT INFORMATION**  
**HARTFORD PETROLEUM RELEASE SITE**

Contact	Mobile Phone	Office Phone	Email
<b>United States Environmental Protection Agency</b>			
Michelle Kaysen	815-207-3269	312-886-4253	kaysen.michelle@epa.gov
<b>Illinois Environmental Protection Agency</b>			
Tom Miller	318-346-5154	618-346-5120	tom.miller@illinois.gov
<b>Apex Oil Company, Inc.</b>			
Jim Sanders	314-378-0776	314-889-0218	jsanders@apexoil.com
Carl Byrd	618-704-5304	618-251-9780	cbyrd@apexoil.com
<b>212 Environmental Consulting, LLC.</b>			
Paul Michalski	513-430-1766	--	paul.michalski@212environmental.com
Shannon Thompson	307-760-1803	--	shannon.thompson@212environmental.com
Todd Aseltyne	419-309-0603	--	todd.aseltyne@212environmental.com

## FIGURES



**SITE LOCATION**

**EXPLANATION**

- 
**WSW-1** PUBLIC WATER SUPPLY WELL AND DESIGNATION
- 
**RW-001** LNAPL RECOVERY WELL
- 
 PROPERTY BOUNDARY (APPROXIMATE)
- 
 SITE BOUNDARY (APPROXIMATE)
- 
 RAILROAD RIGHT-OF-WAY (APPROXIMATE)

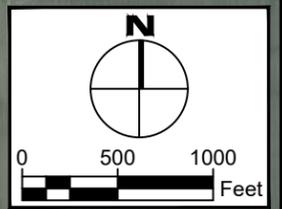
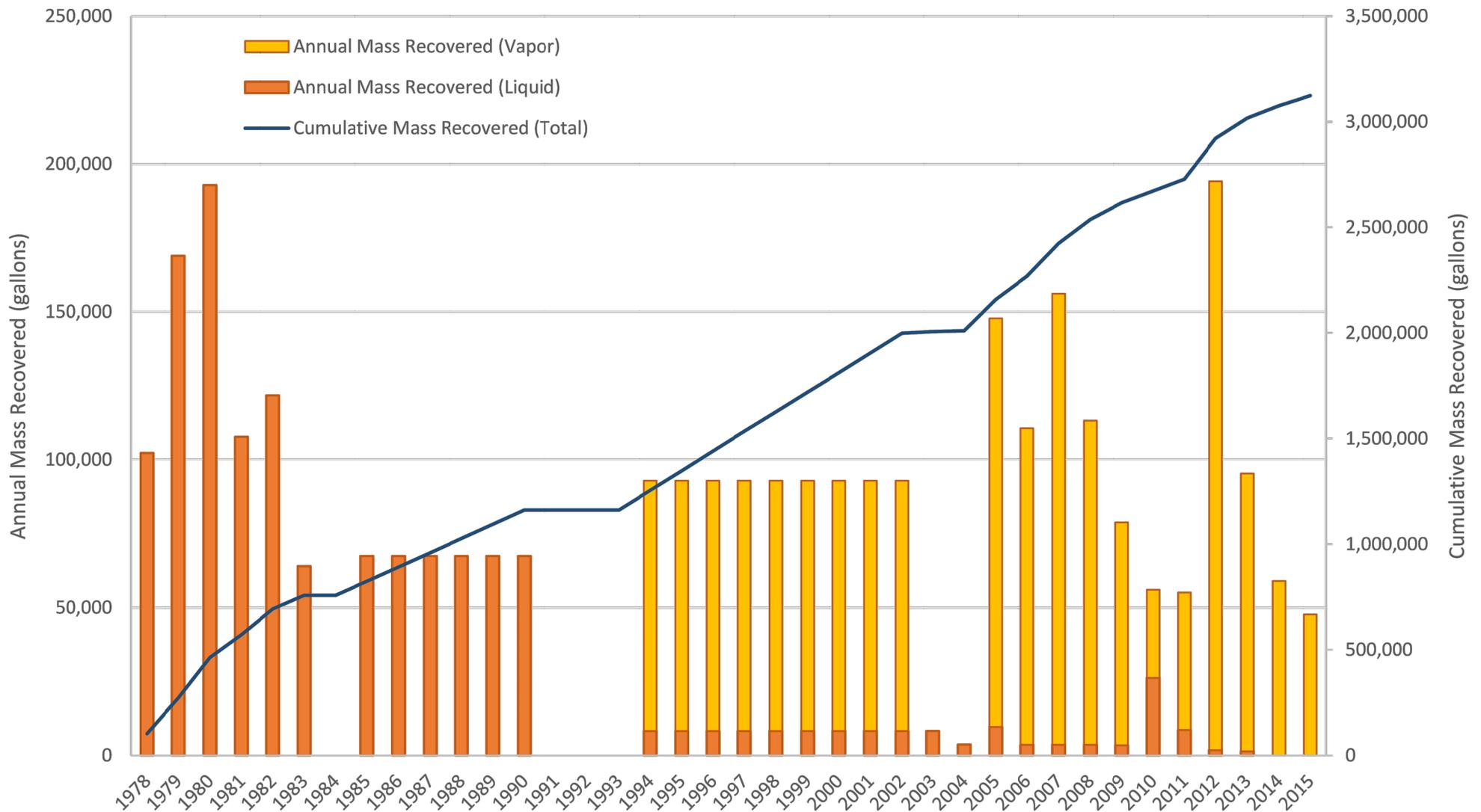


Image Cite: MapMart, Satellite Provider = DigitalGlobe, Image Capture Date = March 9, 2012

<p><b>TITLE:</b> FIGURE 1. SITE LOCATION</p>	<p>1" = 1000' SCALE.</p>	<p>16-001-05 PROJECT NO.</p>	<p>10/07/16 DATE.</p>	 <p>816 Delta Avenue Cincinnati, Ohio 45226 (513) 430-1766</p>
<p><b>SITE:</b> HARTFORD PETROLEUM RELEASE SITE HARTFORD, ILLINOIS</p>	<p>JGP DRAWN.</p>	<p>PEM CHECKED.</p>	<p>REV. 0 REVISION.</p>	



TITLE: FIGURE 2. PETROLEUM RECOVERED SINCE 1978

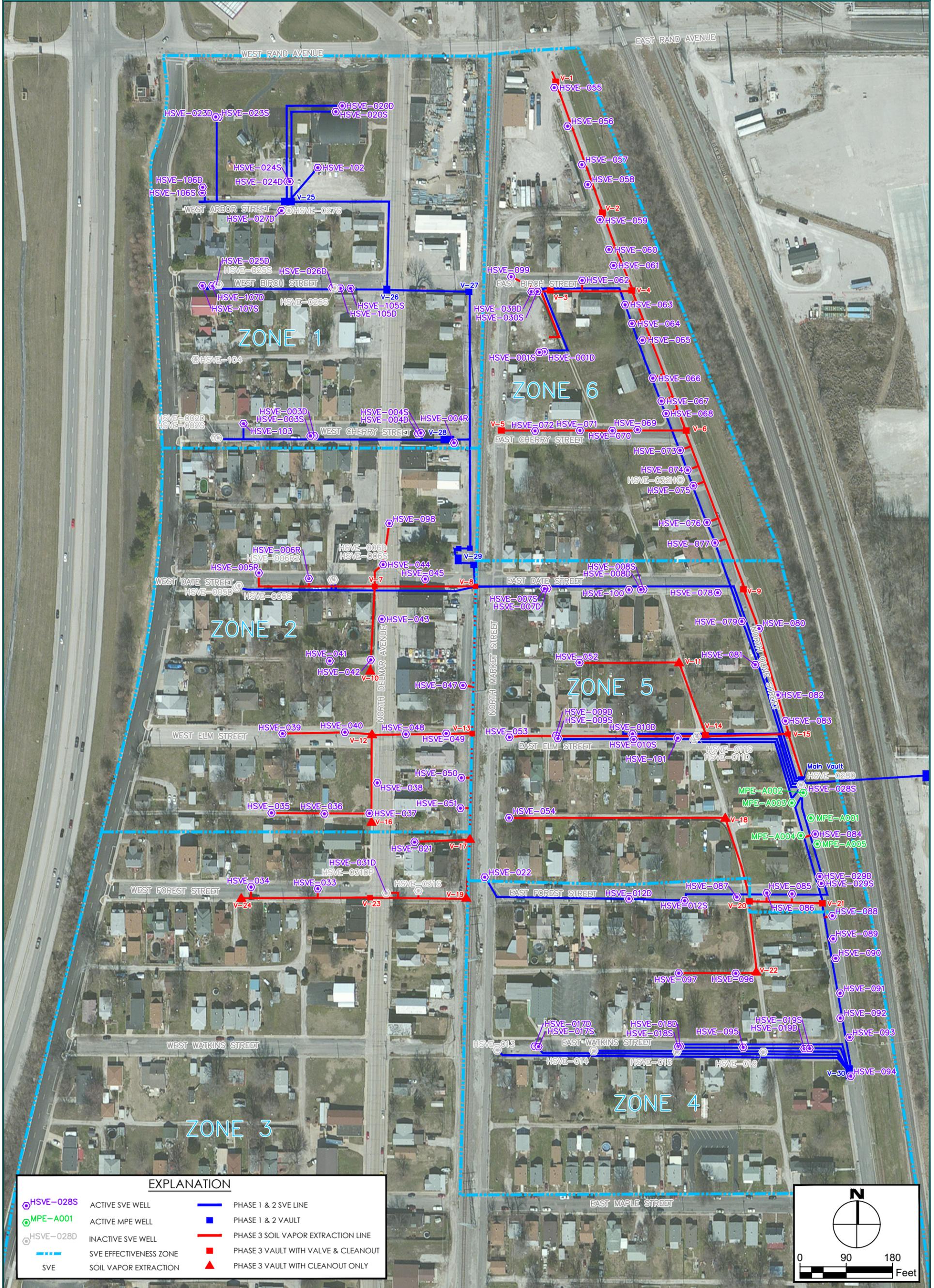
NA  
SCALE. 16-001-05 10/07/16  
PROJECT NO. DATE.

SITE: HARTFORD PETROLEUM RELEASE SITE  
HARTFORD, ILLINOIS

JGP  
DRAWN. PEM  
CHECKED. REV. 0  
REVISION.

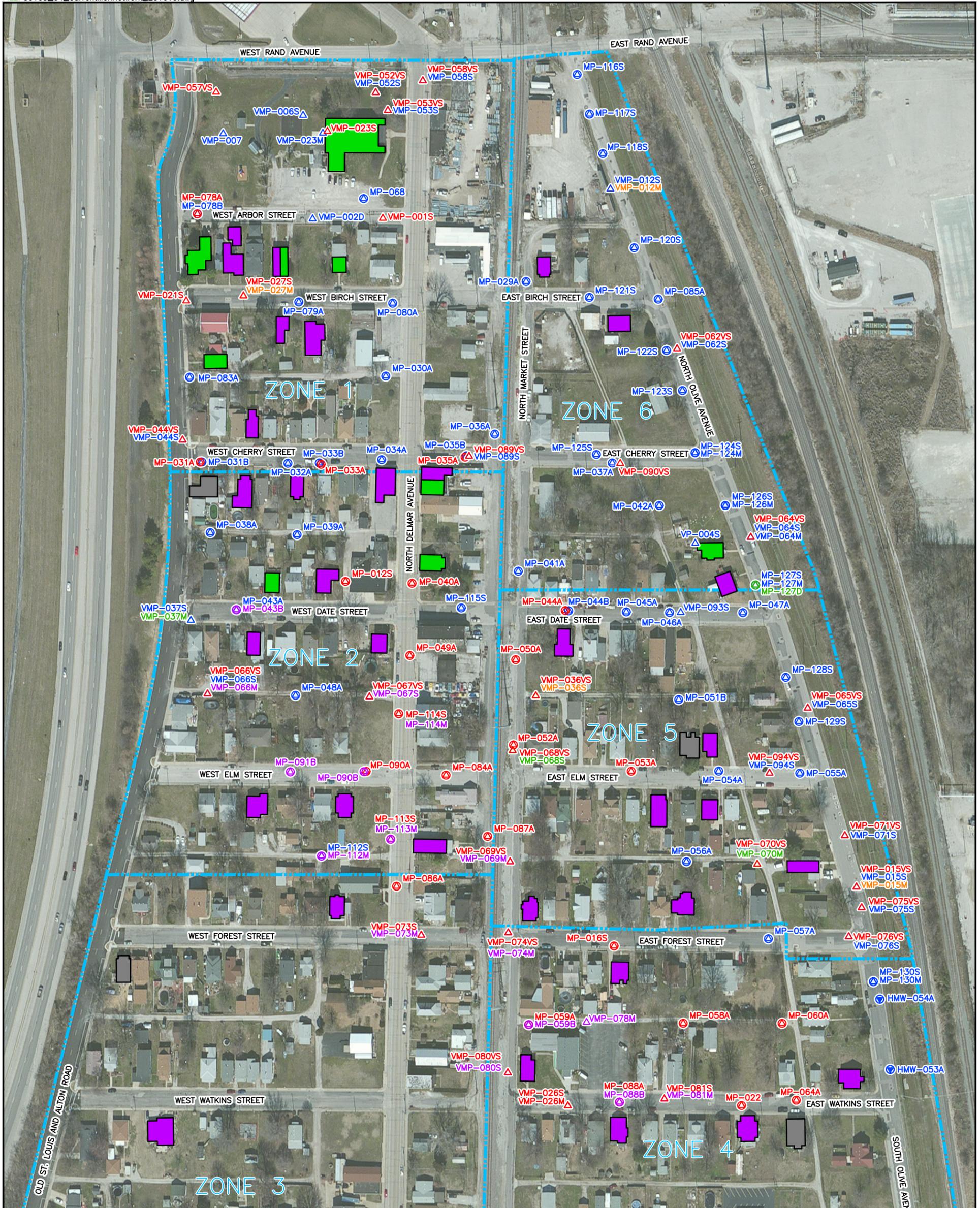


816 Delta Avenue  
Cincinnati, Ohio 45226  
(513) 430-1766



EXPLANATION				
	HSVE-028S	ACTIVE SVE WELL		PHASE 1 & 2 SVE LINE
	MPE-A001	ACTIVE MPE WELL		PHASE 1 & 2 VAULT
	HSVE-028D	INACTIVE SVE WELL		PHASE 3 SOIL VAPOR EXTRACTION LINE
	SVE EFFECTIVENESS ZONE			PHASE 3 VAULT WITH VALVE & CLEANOUT
	SVE	SOIL VAPOR EXTRACTION		PHASE 3 VAULT WITH CLEANOUT ONLY

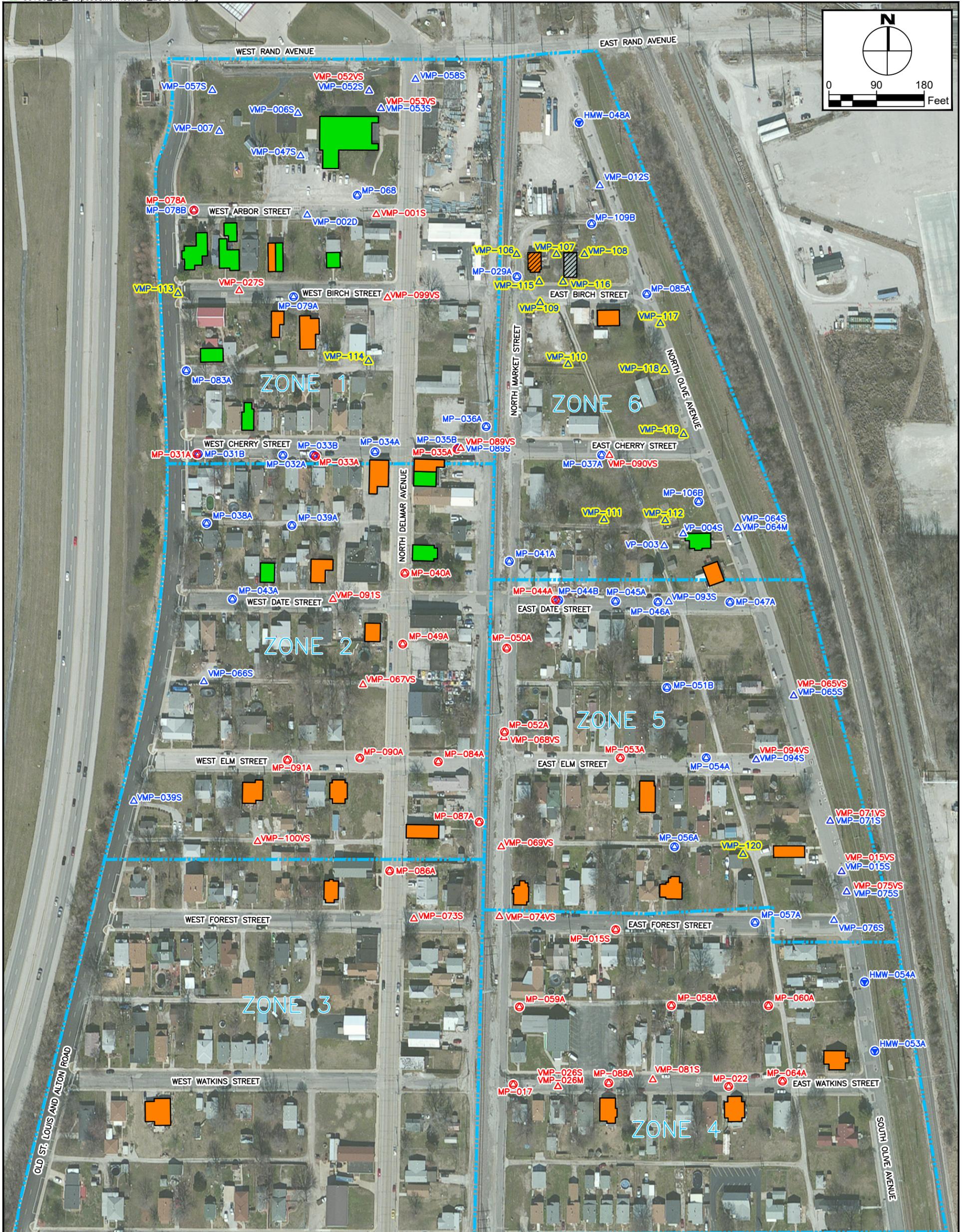
TITLE:	FIGURE 3. HARTFORD VAPOR COLLECTION SYSTEM LAYOUT	1" = 180' SCALE:	16-001-05 PROJECT NO.	10/07/16 DATE:	<p>816 Delta Avenue Cincinnati, Ohio 45226 (513) 430-1766</p>
SITE:	HARTFORD PETROLEUM RELEASE SITE HARTFORD, ILLINOIS	JGP DRAWN:	PEM CHECKED:	REV. 0 REVISION:	



**EXPLANATION**

MP-059A	MULTIPURPOSE MONITORING POINT A CLAY	VMP-015VS	VAPOR MONITORING PROBE A CLAY	HMW-053A	GROUNDWATER MONITORING WELL NORTH OLIVE
MP-127M	MULTIPURPOSE MONITORING POINT NORTH OLIVE	VMP-015S	VAPOR MONITORING PROBE NORTH OLIVE		SVE EFFECTIVENESS ZONE
MP-127D	MULTIPURPOSE MONITORING POINT RAND	VMP-015M	VAPOR MONITORING PROBE B CLAY		STRUCTURE MONITORED WEEKLY
MP-059B	MULTIPURPOSE MONITORING POINT MAIN SILT	VMP-068S	VAPOR MONITORING PROBE RAND		STRUCTURE MONITORED QUARTERLY
		VMP-080S	VAPOR MONITORING PROBE MAIN SILT		STRUCTURE FORMERLY MONITORED

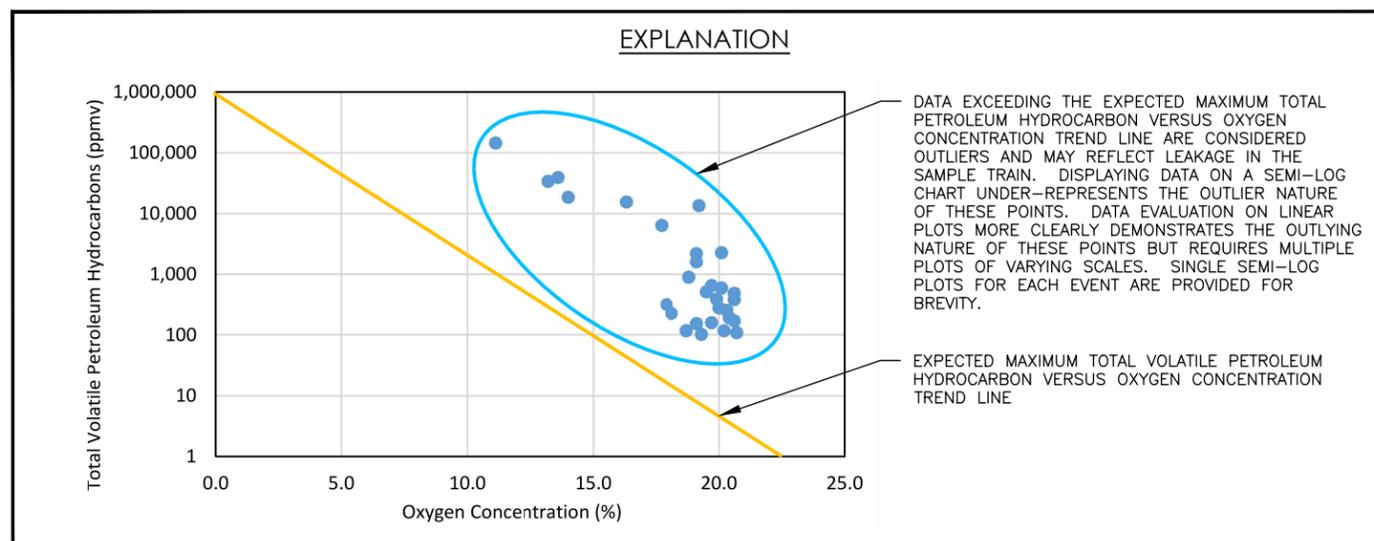
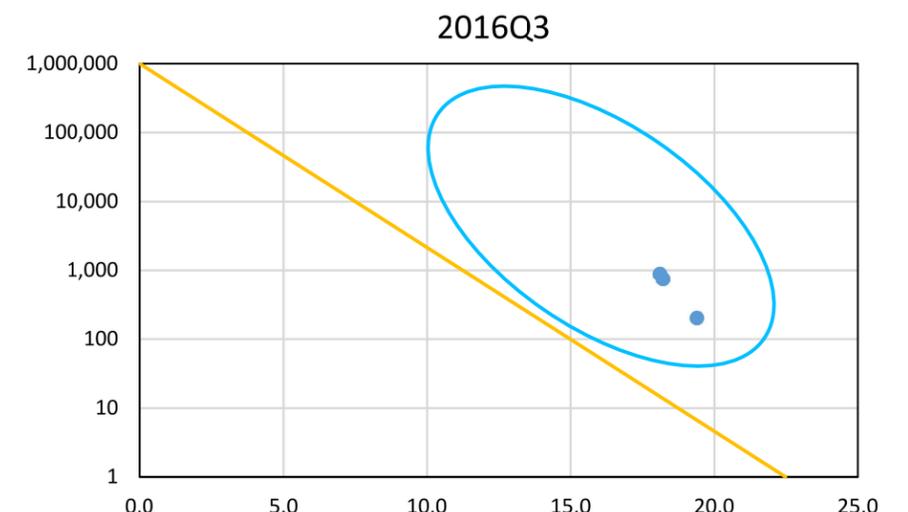
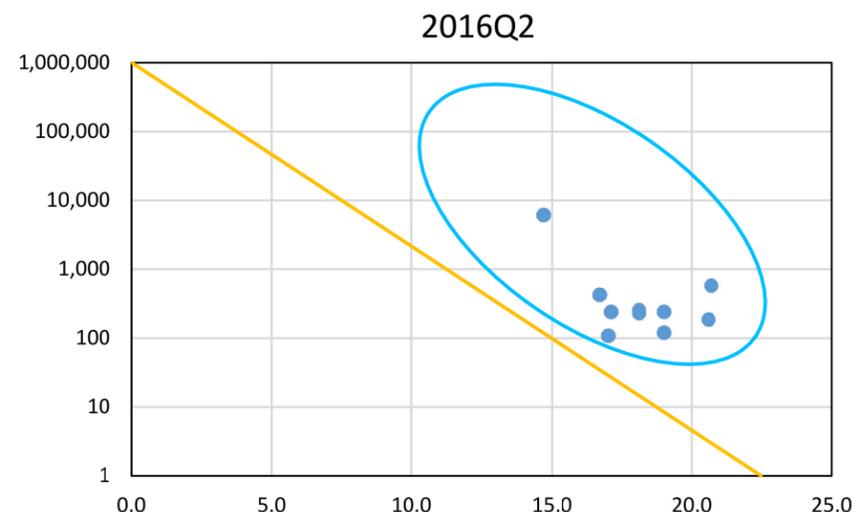
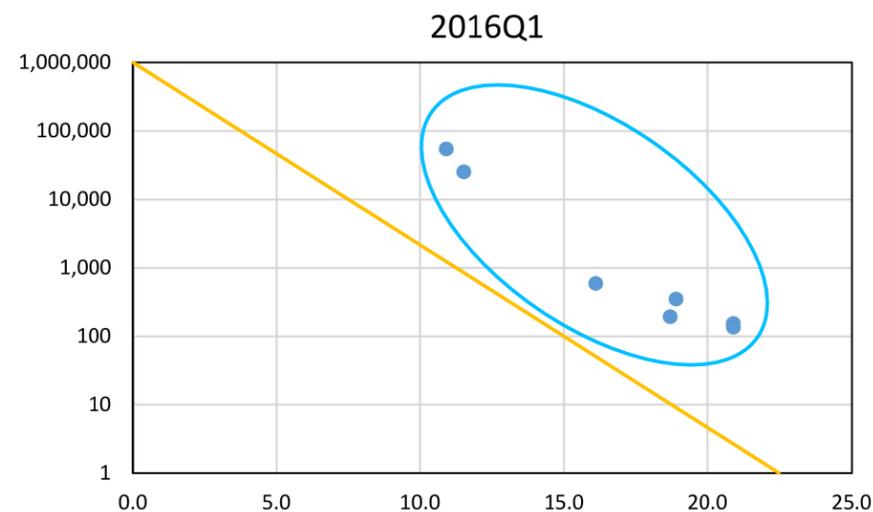
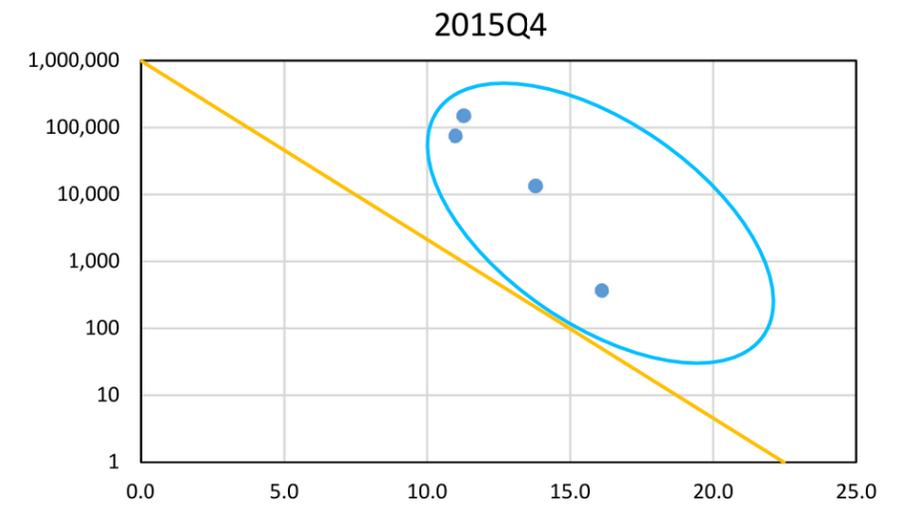
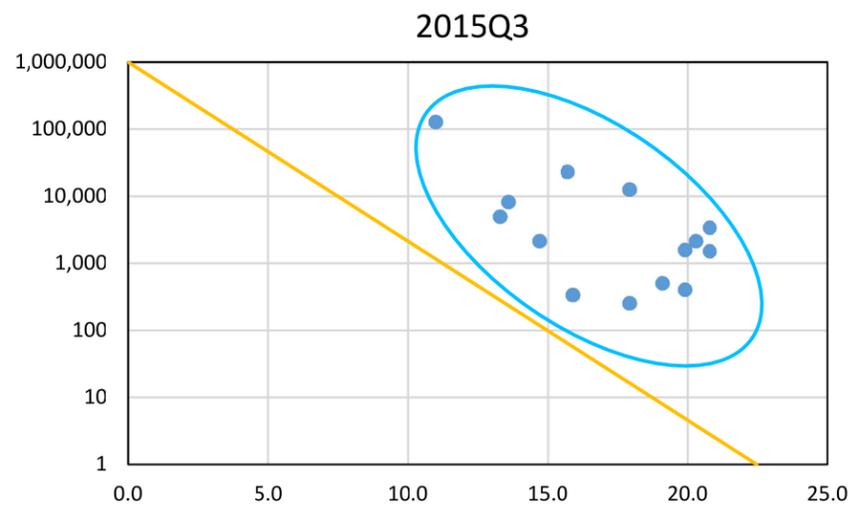
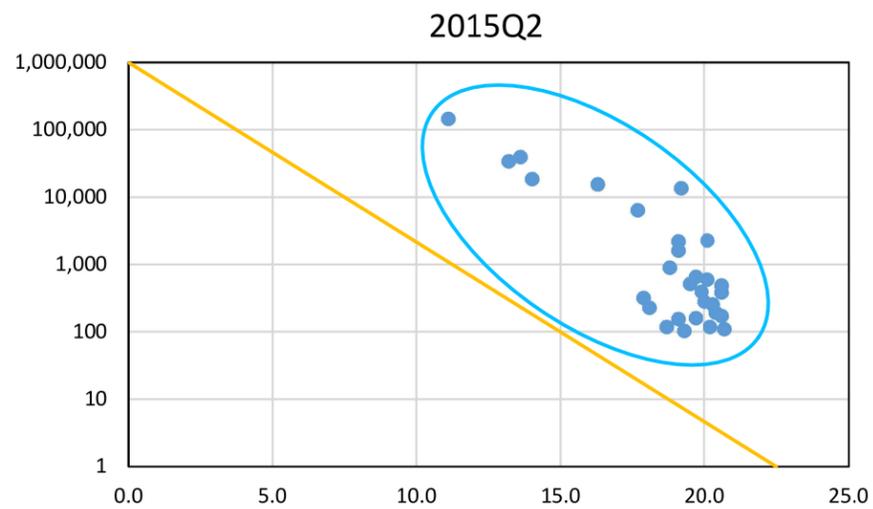
<p>TITLE: <b>FIGURE 4. CURRENT IN-HOME AND EFFECTIVENESS MONITORING NETWORKS</b></p>		<p>1" = 180' SCALE.</p>	<p>16-005-01 PROJECT NO.</p>	<p>10/07/16 DATE.</p>	<p>816 Delta Avenue Cincinnati, Ohio 45226 (513) 430-1766</p>
<p>SITE: <b>HARTFORD PETROLEUM RELEASE SITE HARTFORD, ILLINOIS</b></p>		<p>JGP DRAWN.</p>	<p>SLT CHECKED.</p>	<p>REV. 0 REVISION.</p>	



EXPLANATION

MP-059A	MULTIPURPOSE MONITORING POINT A CLAY	VMP-015VS	VAPOR MONITORING PROBE A CLAY	VMP-106	PROPOSED MONITORING PROBE NORTH OLIVE		STRUCTURE MONITORED WEEKLY
MP-127M	MULTIPURPOSE MONITORING POINT NORTH OLIVE	VMP-015S	VAPOR MONITORING PROBE NORTH OLIVE	HMW-053A	GROUNDWATER MONITORING WELL NORTH OLIVE		STRUCTURE MONITORED FOR RIVER STAGE TRIGGERED EVENTS
	SVE EFFECTIVENESS ZONE						STRUCTURE MONITORED AS PART OF BASELINE STUDY

TITLE: FIGURE 5. PROPOSED EFFECTIVENESS MONITORING NETWORK	1" = 180' SCALE.	16-005-01 PROJECT NO.	10/07/16 DATE.	<p>816 Delta Avenue Cincinnati, Ohio 45226 (513) 430-1766</p>
SITE: HARTFORD PETROLEUM RELEASE SITE HARTFORD, ILLINOIS	JGP DRAWN.	SLT CHECKED.	REV. 0 REVISION.	

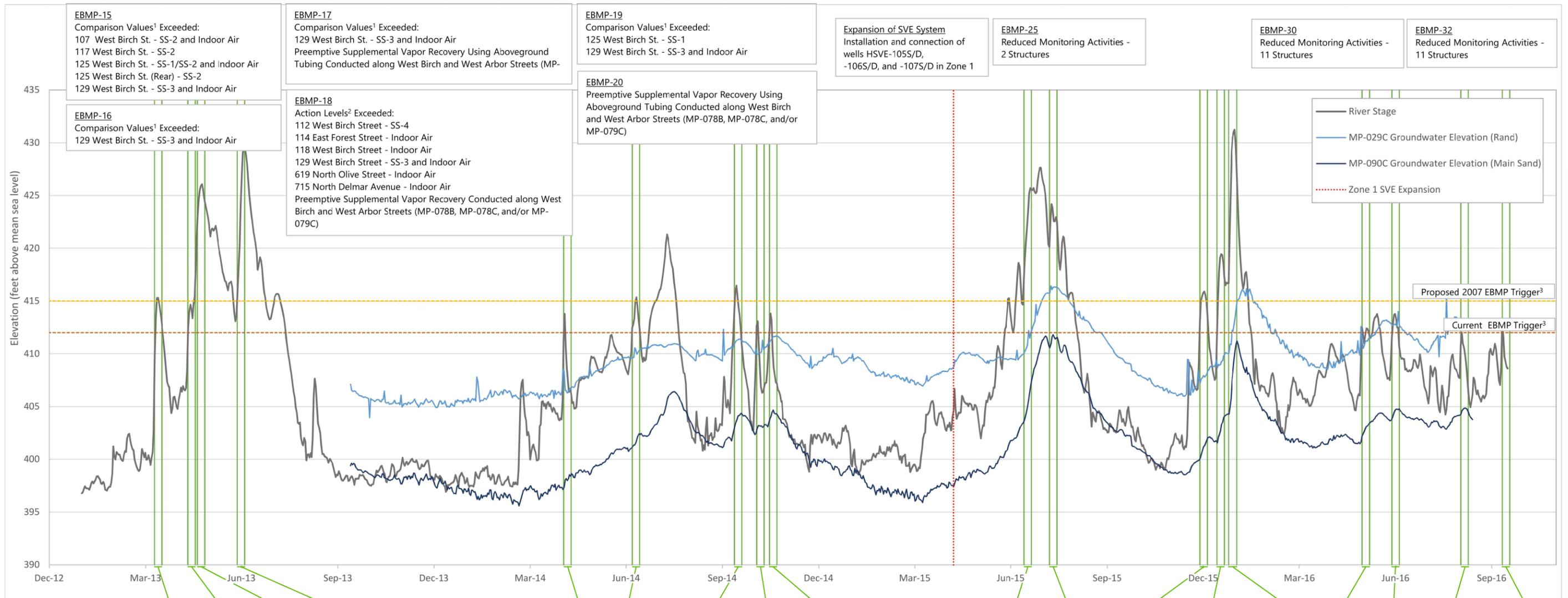


**TITLE:**  
 FIGURE 6. TOTAL VOLATILE PETROLEUM HYDROCARBON VERSUS OXYGEN CONCENTRATION OUTLIER SUMMARY (2ND QUARTER 2015 - 3RD QUARTER 2016)

**SITE:**  
 HARTFORD PETROLEUM RELEASE SITE  
 HARTFORD, ILLINOIS

NA	16-001-05	10/07/16
SCALE	PROJECT NO.	DATE
JGP	PEM	REV. 0
DRAWN	CHECKED	REVISION

816 Delta Avenue  
 Cincinnati, Ohio 45226  
 (513) 430-1766



**EBMP-15**  
Comparison Values<sup>1</sup> Exceeded:  
107 West Birch St. - SS-2 and Indoor Air  
117 West Birch St. - SS-2  
125 West Birch St. - SS-1/SS-2 and Indoor Air  
125 West Birch St. (Rear) - SS-2  
129 West Birch St. - SS-3 and Indoor Air

**EBMP-17**  
Comparison Values<sup>1</sup> Exceeded:  
129 West Birch St. - SS-3 and Indoor Air  
Preemptive Supplemental Vapor Recovery Using Aboveground Tubing Conducted along West Birch and West Arbor Streets (MP-078B, MP-078C, and/or MP-079C)

**EBMP-19**  
Comparison Values<sup>1</sup> Exceeded:  
125 West Birch St. - SS-1  
129 West Birch St. - SS-3 and Indoor Air

**Expansion of SVE System**  
Installation and connection of wells HSVE-105S/D, -106S/D, and -107S/D in Zone 1

**EBMP-25**  
Reduced Monitoring Activities - 2 Structures

**EBMP-30**  
Reduced Monitoring Activities - 11 Structures

**EBMP-32**  
Reduced Monitoring Activities - 11 Structures

**EBMP-16**  
Comparison Values<sup>1</sup> Exceeded:  
129 West Birch St. - SS-3 and Indoor Air

**EBMP-18**  
Action Levels<sup>2</sup> Exceeded:  
112 West Birch Street - SS-4  
114 East Forest Street - Indoor Air  
118 West Birch Street - Indoor Air  
129 West Birch Street - SS-3 and Indoor Air  
619 North Olive Street - Indoor Air  
715 North Delmar Avenue - Indoor Air  
Preemptive Supplemental Vapor Recovery Conducted along West Birch and West Arbor Streets (MP-078B, MP-078C, and/or MP-079C)

**EBMP-20**  
Preemptive Supplemental Vapor Recovery Using Aboveground Tubing Conducted along West Birch and West Arbor Streets (MP-078B, MP-078C, and/or MP-079C)

— River Stage  
— MP-029C Groundwater Elevation (Rand)  
— MP-090C Groundwater Elevation (Main Sand)  
- - - Zone 1 SVE Expansion

Proposed 2007 EBMP Trigger<sup>3</sup>

Current EBMP Trigger<sup>3</sup>

EBMP	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Start Date	3/11/13	4/12/13	4/21/13	5/29/13	4/4/14	6/8/14	9/13/14	10/4/14	10/16/14	6/15/15	7/9/15	11/29/15	12/15/15	12/26/15	5/1/16	5/29/16	8/3/16	9/11/16
Precipitation <sup>4</sup> - prior	0.0	1.1	3.2	1.3	4.0	0.3	0.7	1.0	1.1	2.0	0.8	0.7	1.0	1.1	1.7	0.2	0.1	0.9
Precipitation <sup>4</sup> - during	1.2	0.0	2.0	2.7	0.0	0.8	0.0	0.7	0.0	4.8	1.5	0.3	0.5	8.0	1.7	0.5	0.8	3.1
Water Generation <sup>5</sup> - prior	1,070	<b>1,225</b>	<b>1,750</b>	1,825	<b>633</b>	1,960	2,020	2,220	2,420	1,690	3,475	1,340	1,340	1,720	1,120	1,160	1,520	750
Water Generation <sup>5</sup> - during	<b>1,067</b>	1,363	3,420	<b>2,042</b>	<b>1,320</b>	<b>2,280</b>	<b>1,500</b>	<b>1,580</b>	<b>2,650</b>	3,317	3,817	1,420	1,483	4,470	1,780	1,260	<b>1,075</b>	<b>740</b>
Maximum Indoor Air Result <sup>6</sup>	290	17	54	34	20.4	8.1	5.5	4.4	5.2	6.3	3.5	4.2	7.0	4.1	8.0	3.8	8.0	8.0
Location Maximum Indoor Air	107WBirch	107WBirch	111WDate	118WBirch	129WBirch	119WBirch	119WBirch	119WBirch	117WBirch	125WBirch	117WBirch	111WDate	610NOldStLouis	610NOldStLouis	117WBirch	117WBirch	610NOldStLouis	610NOldStLouis
Maximum Sub-Slab Vapor Result <sup>7</sup>	120,000	8,900	75,000	52,000	85,000	7.8	101	19.5	108	35	0.0	110	28	26	3.4	0.0	0.0	0.0
Location Maximum Sub-Slab	129WBirch	129WBirch	119WCherry	129WBirch	129WBirch	507NOlive	117WBirch	117WBirch	117WBirch	119WDate	--	507NOlive	507NOlive	117WBirch	309NOlive	--	--	--

**EXPLANATION**

**Notes:**

- Comparison Values for laboratory analytical results provided in Table 5-1 of revised *Effectiveness Monitoring Plan* (ENSR 2007). Analytical results that exceed comparison values in both indoor air and sub-slab vapor may be an indication of a completed vapor intrusion pathway.
- Action Levels defined in the final *Interim In-Home Effectiveness Monitoring Work Plan* (Trihydro 2014) and include total organic vapor concentrations in indoor air (10 ppmv) and sub-slab soil vapor (350 ppmv). Measurements of total organic vapor are collected using a flame ionization detector.
- Minimum EBMP trigger defined in the final *Interim In-Home Effectiveness Monitoring Work Plan* (Trihydro 2014) is equal to 412 feet above mean sea level as measured at the Mel Price Lock and Dam; EBMP trigger defined in the revised *Effectiveness Monitoring Plan* (ENSR 2007) is equal to 415 feet above mean sea level as measured at the Mel Price Lock and Dam.
- Precipitation measured at the thermal treatment system located at the Premcor facility, reported in inches (in). Prior indicates within 7 days before the event.
- Water generation reported as average water generated at the thermal treatment system, reported in gallons per day (gpd). Prior indicates within 7 days before the event.
- Indoor air results measured using a flame ionization detector; reported in parts per million by volume (ppmv). Screening results attributed to a secondary source within a structure were excluded from this summary.
- Sub-slab soil vapor results measured using a flame ionization detector; reported in parts per million by volume (ppmv).

Values in **BOLD** indicate that line sweeping of the lateral soil vapor extraction system transmission lines was conducted during the river stage triggered event

**TITLE:** FIGURE 7. RIVER STAGE TRIGGERED EVENT SUMMARY (DECEMBER 2012 - SEPTEMBER 2016)

**SITE:** HARTFORD PETROLEUM RELEASE SITE HARTFORD, ILLINOIS

NA	16-001-05	10/07/16
SCALE:	PROJECT NO.	DATE:
JGP	PEM	REV. 0
DRAWN:	CHECKED:	REVISION:

**TWO NET TWO ENVIRONMENTAL**

816 Delta Avenue  
Cincinnati, Ohio 45226  
(513) 430-1766

FILE: 00105\_07\_EBMP\_Summary\_201610.dwg

## APPENDIX A

**TABLE X. EFFECTIVENESS MONITORING PNEUMATIC SCREENING**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	2016Q3							2016Q2					2016Q1				
			Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	Static Pressure/Vacuum (in-H2O)	Estimated Soil Gas Permeability (cm2)	Oxygen (%)	TVPH (ppmv)	Screen Occlusion / Deadhead (Yes/No)	Static Pressure/Vacuum (in-H2O)	Estimated Soil Gas Permeability (cm2)	Oxygen (%)	TVPH (ppmv)	Screen Occlusion / Deadhead (Yes/No)	Static Pressure/Vacuum (in-H2O)	Estimated Soil Gas Permeability (cm2)	Oxygen (%)	TVPH (ppmv)	Screen Occlusion / Deadhead (Yes/No)
VMP-001S	Zone 1	A Clay	5.19	5.69	3.25	--	--	--	Y	--	--	5.00	1,230	N	0.12	3.96E-10	12.1	520	N
VMP-002D	Zone 1	N Olive	12.73	13.23	0.06	8.70E-09	20.0	2.60	N	--	--	20.1	23.5	N	0.00	6.35E-09	20.6	4.00	N
VMP-006S	Zone 1	N Olive	10.71	11.21	-2.70	--	--	--	Y	--	--	--	--	Y	0.30	--	--	--	Y
VMP-007	Zone 1	N Olive	10.58	11.08	-2.25	1.44E-08	19.4	4.50	N	--	--	--	--	Y	-0.78	7.27E-09	20.8	1.00	N
VMP-012S	Zone 6	N Olive	10.50	11.00	--	--	--	--	N	--	--	--	--	N	--	--	--	--	N
VMP-015M	Zone 5	B Clay	18.50	19.00	-0.01	5.30E-09	2.70	71.0	N	--	--	5.60	135	N	-0.16	5.60E-09	2.20	58,540	N
VMP-015S	Zone 5	N Olive	12.00	12.50	0.16	9.54E-09	12.3	17.5	N	--	--	7.30	1,000	N	-0.05	1.39E-08	4.10	0.00	N
VMP-015VS	Zone 5	A Clay	5.50	6.00	-4.29	--	--	--	N	--	--	14.7	6,100	N	0.62	3.19E-09	11.5	25,120	N
VMP-023M	Zone 1	N Olive	15.03	15.53	-0.08	9.15E-09	15.9	0.00	N	--	--	19.8	4.00	N	-1.37	7.09E-09	20.9	2.30	N
VMP-023S	Zone 1	A Clay	5.05	5.55	-1.50	--	--	--	Y	--	--	--	--	Y	-1.62	4.05E-10	20.7	3.50	N
VMP-026M	Zone 4	A Clay	14.52	15.02	-4.75	--	--	--	Y	--	--	--	--	N	-0.65	3.87E-09	19.0	0.00	N
VMP-026S	Zone 4	A Clay	9.52	10.02	-3.81	--	--	--	Y	--	--	17.6	15.0	N	-2.30	3.87E-09	--	--	N
VMP-027M	Zone 1	B Clay	15.54	16.04	-9.52	--	--	--	Y	--	--	--	--	Y	-2.61	1.54E-08	20.9	2.00	N
VMP-027S	Zone 1	A Clay	9.54	10.04	-14.86	--	--	--	Y	--	--	13.2	45.0	N	-0.08	1.81E-09	20.9	2.00	N
VMP-036S	Zone 5	B Clay	11.51	12.01	0.08	3.44E-09	0.10	7,950	N	--	--	1.20	5,760	N	-0.27	3.85E-09	3.40	4,680	N
VMP-036VS	Zone 5	A Clay	4.51	5.01	0.05	3.09E-08	12.4	88.5	N	--	--	17.8	80.0	N	-0.22	2.36E-08	18.7	193	N
VMP-052S	Zone 1	N Olive	12.00	12.50	-0.32	1.05E-08	5.10	0.00	N	--	--	--	--	Y	-7.68	1.92E-09	20.9	1.00	N
VMP-052VS	Zone 1	A Clay	6.51	7.01	-0.05	--	--	--	Y	--	--	--	--	Y	-0.57	--	--	--	Y
VMP-053S	Zone 1	N Olive	11.50	12.00	-0.25	1.28E-08	0.20	8.00	N	--	--	0.20	480,000	N	-8.42	6.19E-09	13.9	22.5	N
VMP-053VS	Zone 1	A Clay	6.50	7.00	0.00	2.56E-08	6.20	0.00	N	--	--	0.20	295,000	N	-8.74	8.70E-09	18.8	9.50	N
VMP-057VS	Zone 1	A Clay	4.99	5.49	0.12	3.59E-08	18.0	77.6	N	--	--	--	--	Y	6.00	2.26E-09	15.3	0.00	N
VMP-058S	Zone 1	N Olive	11.50	12.00	0.15	1.08E-08	0.20	25,250	N	--	--	11.7	320	N	-1.01	6.49E-09	2.80	1,960	N
VMP-058VS	Zone 1	A Clay	4.50	5.00	0.12	8.10E-09	0.10	10,700	N	--	--	5.30	3,050	N	-0.54	3.34E-09	2.20	7,770	N
VMP-064M	Zone 6	N Olive	12.00	12.50	-8.40	2.32E-09	0.30	38,090	N	--	--	--	--	Y	0.74	--	--	--	Y
VMP-064S	Zone 6	N Olive	8.00	8.50	-14.02	-2.07E-08	0.40	5,050	N	--	--	1.70	20.0	N	-0.22	--	--	--	Y
VMP-064VS	Zone 6	A Clay	4.50	5.00	0.07	7.65E-09	0.10	1,740	N	--	--	0.20	37.0	N	-0.11	6.17E-09	4.90	640	N
VMP-065S	Zone 5	N Olive	10.96	11.46	-17.88	--	--	--	Y	--	--	--	--	Y	-0.16	2.52E-09	5.80	610	N
VMP-065VS	Zone 5	A Clay	4.46	4.96	-0.78	3.86E-09	0.10	6,180	N	--	--	--	--	Y	-0.14	3.61E-09	6.80	2,470	N
VMP-066M	Zone 2	Main Silt	16.99	17.49	0.80	1.07E-08	4.70	29.0	N	--	--	6.60	0.00	N	-0.68	7.48E-09	10.8	0.00	N
VMP-066S	Zone 2	N Olive	10.49	10.99	0.10	1.77E-08	4.70	1.80	N	--	--	13.6	0.00	N	-0.13	9.65E-09	15.3	0.00	N
VMP-066VS	Zone 2	A Clay	4.49	4.99	0.20	3.26E-08	11.0	6.60	N	--	--	14.6	0.00	N	-0.12	1.32E-08	19.7	0.00	N
VMP-067S	Zone 2	Main Silt	16.48	16.98	0.11	8.96E-09	17.5	2.24	N	--	--	18.7	2.20	N	-0.13	6.44E-09	20.6	0.00	N
VMP-067VS	Zone 2	A Clay	5.48	5.98	0.24	3.52E-08	17.9	5.35	N	--	--	18.7	7.40	N	0.00	1.38E-08	20.9	0.00	N
VMP-068S	Zone 5	Rand	17.50	18.00	0.35	9.39E-09	0.20	28,650	N	--	--	0.20	12,300	N	-0.22	8.14E-09	1.60	14,530	N
VMP-068VS	Zone 5	A Clay	5.50	6.00	0.44	3.45E-08	12.4	34.5	N	--	--	19.0	240	N	-0.09	2.04E-08	19.8	4.16	N
VMP-069M	Zone 5	Main Silt	13.50	14.00	0.22	9.24E-09	19.3	70.0	N	--	--	20.8	15.0	N	-0.41	1.02E-08	20.8	0.00	N

**TABLE X. EFFECTIVENESS MONITORING PNEUMATIC SCREENING**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	2016Q3					2016Q2					2016Q1				
					Static Pressure/ Vacuum (in-H2O)	Estimated Soil Gas Permeability (cm2)	Oxygen (%)	TVPH (ppmv)	Screen Occlusion / Deadhead (Yes/No)	Static Pressure/ Vacuum (in-H2O)	Estimated Soil Gas Permeability (cm2)	Oxygen (%)	TVPH (ppmv)	Screen Occlusion / Deadhead (Yes/No)	Static Pressure/ Vacuum (in-H2O)	Estimated Soil Gas Permeability (cm2)	Oxygen (%)	TVPH (ppmv)	Screen Occlusion / Deadhead (Yes/No)
VMP-069VS	Zone 5	A Clay	5.50	6.00	0.27	1.95E-08	15.3	146	N	--	--	20.7	18.5	N	-0.05	1.99E-08	20.7	0.00	N
VMP-070M	Zone 5	Rand	19.49	19.99	0.85	7.33E-09	0.10	1,460,000	N	--	--	4.20	515,000	N	0.00	8.53E-09	2.10	1,000,000	N
VMP-070VS	Zone 5	A Clay	4.49	4.99	-0.62	--	--	--	Y	--	--	--	--	Y	2.26	--	--	--	Y
VMP-071S	Zone 5	N Olive	10.00	10.50	-1.70	3.96E-09	18.9	63.0	N	--	--	17.1	240	N	-1.97	7.71E-09	20.2	637	N
VMP-071VS	Zone 5	A Clay	5.50	6.00	-0.05	1.86E-08	20.5	12.0	N	--	--	20.6	186	N	-0.78	3.82E-08	20.6	448	N
VMP-073M	Zone 3	Main Silt	18.50	19.00	-0.61	8.45E-09	--	--	N	--	--	20.0	4.00	N	-0.30	5.51E-09	20.2	0.00	N
VMP-073S	Zone 3	A Clay	7.50	8.00	-0.49	5.96E-09	16.6	20.7	N	--	--	18.3	4.40	N	-0.47	2.96E-09	18.6	0.00	N
VMP-074M	Zone 4	Main Silt	14.98	15.48	-0.77	7.58E-09	15.9	5.60	N	--	--	18.1	23.0	N	-1.75	8.45E-09	19.8	5.26	N
VMP-074VS	Zone 4	A Clay	5.98	6.48	0.06	1.47E-08	20.5	2.40	N	--	--	20.9	22.0	N	-0.10	1.54E-08	20.9	0.00	N
VMP-075S	Zone 5	N Olive	13.00	13.50	0.34	8.33E-09	5.20	18.0	N	--	--	13.6	42.0	N	0.05	9.86E-09	1.70	2,670	N
VMP-075VS	Zone 5	A Clay	5.00	5.50	0.33	2.18E-08	6.00	39.0	N	--	--	14.7	38.0	N	0.00	2.06E-08	6.10	27.0	N
VMP-076S	Zone 5	N Olive	10.51	11.01	0.61	1.34E-08	18.5	0.00	N	--	--	20.2	35.5	N	-0.15	1.38E-08	20.8	0.00	N
VMP-076VS	Zone 5	A Clay	4.51	5.01	0.30	1.08E-08	19.1	0.00	N	--	--	20.1	40.0	N	-0.11	1.00E-08	20.4	0.00	N
VMP-078M	Zone 4	Main Silt	15.50	16.00	--	--	--	--	N	--	--	--	--	N	--	--	--	--	N
VMP-080S	Zone 4	Main Silt	15.96	16.46	0.26	3.96E-10	0.60	0.00	N	--	--	3.50	110	N	-0.33	3.51E-09	6.40	0.00	N
VMP-080VS	Zone 4	A Clay	4.46	4.96	0.16	1.90E-08	16.9	1.20	N	--	--	20.2	6.30	N	-0.04	1.53E-08	20.4	3.81	N
VMP-081M	Zone 4	Main Silt	16.58	17.58	0.02	7.75E-09	16.6	116	N	--	--	20.1	9.50	N	-0.06	9.29E-09	19.6	0.00	N
VMP-081S	Zone 4	A Clay	13.08	13.58	0.07	1.02E-08	18.1	4.45	N	--	--	20.4	7.50	N	-0.10	1.20E-08	20.0	0.00	N
VMP-089S	Zone 1	N Olive	14.00	14.50	-2.58	1.24E-08	20.2	13.0	N	--	--	20.3	17.0	N	0.00	6.95E-09	19.8	0.00	N
VMP-089VS	Zone 1	A Clay	5.50	6.00	-1.91	2.13E-08	20.9	16.2	N	--	--	20.8	18.7	N	0.00	1.30E-08	20.9	1.00	N
VMP-090VS	Zone 6	A Clay	5.48	5.98	-8.31	--	--	--	N	--	--	--	--	Y	-0.22	--	--	--	Y
VMP-093S	Zone 5	N Olive	9.51	10.01	0.20	4.71E-09	12.9	32.5	N	--	--	15.5	34.0	N	0.00	4.27E-09	17.6	0.00	N
VMP-094S	Zone 5	N Olive	13.48	13.98	-0.37	3.43E-09	0.10	1,300	N	--	--	--	--	Y	0.54	3.78E-09	2.20	770	N
VMP-094VS	Zone 5	A Clay	5.48	5.98	0.14	4.84E-09	0.10	374	N	--	--	0.20	70.0	N	0.00	5.19E-09	2.90	1,040	N
VP-004S	Zone 6	N Olive	11.79	12.29	0.14	9.14E-10	0.10	536,000	N	--	--	0.70	220,000	N	0.00	2.99E-09	6.30	105,000	N

Notes:

- VMP-021S, VMP-037M, VMP-037S, VMP-044S, and VMP-044VS along N Old St. Louis; VMP-062S, VMP-062VS on N Olive; and VMP-078M have been paved over
- VMP-012M and VMP-012S are inaccessible due to well casing being too deep/too narrow below ground to connect ball valve
- VMP-023S, VMP-023M, VMP-006S, VMP-007 and VP-004S well vault filled with dirt

**TABLE X. EFFECTIVENESS MONITORING PNEUMATIC SCREENING**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	2015Q4					2015Q3					2015Q2				
					Static Pressure/ Vacuum (in-H2O)	Estimated Soil Gas Permeability (cm2)	Oxygen (%)	TVPH (ppmv)	Screen Occlusion / Deadhead (Yes/No)	Static Pressure/ Vacuum (in-H2O)	Estimated Soil Gas Permeability (cm2)	Oxygen (%)	TVPH (ppmv)	Screen Occlusion / Deadhead (Yes/No)	Static Pressure/ Vacuum (in-H2O)	Estimated Soil Gas Permeability (cm2)	Oxygen (%)	TVPH (ppmv)	Screen Occlusion / Deadhead (Yes/No)
VMP-001S	Zone 1	A Clay	5.19	5.69	0.00	4.18E-10	18.7	22.8	N	0.00	1.61E-10	12.6	1,570	N	-0.12	2.22E-10	10.1	4,800	N
VMP-002D	Zone 1	N Olive	12.73	13.23	0.00	7.88E-09	20.0	0.00	N	0.00	8.10E-09	19.5	2.42	N	0.00	6.40E-09	19.8	52.2	N
VMP-006S	Zone 1	N Olive	10.71	11.21	0.00	1.96E-09	2.90	32.0	N	0.10	--	--	--	Y	-3.72	--	--	--	Y
VMP-007	Zone 1	N Olive	10.58	11.08	-0.22	1.19E-08	20.7	29.8	N	-1.78	1.38E-08	19.5	0.00	N	-0.19	4.33E-09	20.1	0.00	N
VMP-012S	Zone 6	N Olive	10.50	11.00	--	--	--	--	N	--	--	--	--	N	20.65	6.37E-09	4.90	1,000,000	N
VMP-015M	Zone 5	B Clay	18.50	19.00	0.00	5.02E-09	4.80	0.00	N	-0.18	7.75E-09	0.00	150,000	N	0.70	4.63E-09	12.0	120	N
VMP-015S	Zone 5	N Olive	12.00	12.50	0.00	9.29E-09	18.7	12.0	N	-0.11	1.38E-08	1.20	7,800	N	0.80	2.98E-09	16.5	121	N
VMP-015VS	Zone 5	A Clay	5.50	6.00	0.00	2.46E-09	5.70	9,800	N	0.00	2.18E-09	5.00	10,230	N	0.76	3.34E-09	1.50	15,840	N
VMP-023M	Zone 1	N Olive	15.03	15.53	0.00	8.92E-09	19.1	8.50	N	0.00	--	--	--	Y	-0.74	6.61E-09	20.1	594	N
VMP-023S	Zone 1	A Clay	5.05	5.55	0.00	6.88E-10	--	--	N	--	--	--	--	Y	0.00	--	--	--	Y
VMP-026M	Zone 4	A Clay	14.52	15.02	0.00	3.87E-09	14.4	0.00	N	0.00	3.87E-09	13.9	0.00	N	-5.03	3.87E-09	12.7	106	N
VMP-026S	Zone 4	A Clay	9.52	10.02	0.00	3.44E-09	11.7	0.00	N	-0.18	3.44E-09	11.7	0.00	N	-16.65	3.44E-09	11.1	22.5	N
VMP-027M	Zone 1	B Clay	15.54	16.04	0.00	7.48E-08	20.9	0.00	N	0.00	3.59E-08	20.5	10.5	N	-0.29	2.56E-08	20.6	0.00	N
VMP-027S	Zone 1	A Clay	9.54	10.04	0.00	6.09E-09	20.4	1.50	N	0.00	1.05E-08	12.7	36.1	N	-0.33	5.07E-09	14.1	0.00	N
VMP-036S	Zone 5	B Clay	11.51	12.01	0.00	2.41E-09	2.00	1,420	N	0.00	4.21E-09	4.30	1,320	N	-0.37	3.01E-09	0.60	204	N
VMP-036VS	Zone 5	A Clay	4.51	5.01	0.00	7.48E-09	17.6	32.0	N	0.00	3.59E-08	13.7	0.00	N	-0.16	2.64E-08	18.2	50.9	N
VMP-052S	Zone 1	N Olive	12.00	12.50	0.00	7.58E-09	11.8	24.0	N	0.00	--	--	--	Y	-5.29	3.52E-09	20.3	0.00	N
VMP-052VS	Zone 1	A Clay	6.51	7.01	0.00	--	--	--	Y	1.17	2.99E-08	16.0	0.00	N	0.25	5.79E-08	20.6	0.00	N
VMP-053S	Zone 1	N Olive	11.50	12.00	0.00	9.59E-09	5.60	14.0	N	0.00	1.05E-08	2.70	0.00	N	-5.04	9.15E-09	5.70	48,800	N
VMP-053VS	Zone 1	A Clay	6.50	7.00	0.00	1.58E-08	16.6	8.10	N	0.00	1.63E-08	14.2	0.00	N	-2.50	3.30E-09	20.9	0.00	N
VMP-057VS	Zone 1	A Clay	4.99	5.49	0.00	6.05E-08	20.4	56.4	N	0.15	2.35E-08	20.8	3,400	N	-0.42	1.06E-08	0.70	0.00	N
VMP-058S	Zone 1	N Olive	11.50	12.00	0.00	1.90E-08	0.00	220,540	N	0.00	9.00E-09	0.60	4,900	N	-0.52	8.45E-09	0.20	2,170	N
VMP-058VS	Zone 1	A Clay	4.50	5.00	0.00	2.03E-08	0.00	31,900	N	0.00	7.32E-09	1.00	16,500	N	-0.05	9.01E-09	1.00	25,270	N
VMP-064M	Zone 6	N Olive	12.00	12.50	0.00	3.72E-09	2.50	64,250	N	-0.50	4.02E-09	2.70	49,780	N	-0.16	4.00E-09	0.50	42,000	N
VMP-064S	Zone 6	N Olive	8.00	8.50	0.00	1.79E-09	1.60	168	N	-0.49	5.73E-09	1.10	518	N	-0.19	8.77E-10	1.50	0.00	N
VMP-064VS	Zone 6	A Clay	4.50	5.00	0.00	5.02E-09	3.40	245	N	-0.14	1.12E-08	0.10	170	N	0.26	8.70E-09	1.40	0.00	N
VMP-065S	Zone 5	N Olive	10.96	11.46	0.00	1.94E-09	6.40	50.0	N	0.00	2.93E-09	3.30	2,350	N	0.31	1.14E-09	3.20	51.5	N
VMP-065VS	Zone 5	A Clay	4.46	4.96	0.00	5.14E-09	0.10	4,300	N	-0.18	4.34E-10	1.80	12,000	N	0.20	7.55E-09	1.80	3,640	N
VMP-066M	Zone 2	Main Silt	16.99	17.49	0.00	7.48E-09	6.10	0.00	N	-0.38	6.84E-09	5.40	0.00	N	0.00	8.57E-09	9.80	0.00	N
VMP-066S	Zone 2	N Olive	10.49	10.99	0.00	1.31E-08	10.7	234	N	0.00	1.63E-08	11.3	0.00	N	-0.05	1.29E-08	12.9	0.00	N
VMP-066VS	Zone 2	A Clay	4.49	4.99	0.00	2.42E-08	12.7	0.00	N	0.00	2.76E-08	19.4	3.00	N	0.00	2.04E-08	16.2	0.00	N
VMP-067S	Zone 2	Main Silt	16.48	16.98	0.00	7.45E-09	19.8	0.00	N	0.00	9.39E-09	15.4	10.0	N	-0.43	6.56E-09	19.1	0.00	N
VMP-067VS	Zone 2	A Clay	5.48	5.98	0.00	2.16E-08	20.0	0.00	N	0.00	2.24E-08	16.6	4.94	N	0.00	2.16E-08	19.3	0.00	N
VMP-068S	Zone 5	Rand	17.50	18.00	0.00	8.33E-09	0.00	13,850	N	0.00	8.49E-09	0.20	23,000	N	0.23	8.03E-09	1.50	11,760	N
VMP-068VS	Zone 5	A Clay	5.50	6.00	0.00	1.87E-08	19.0	14.2	N	0.00	2.24E-08	6.60	2,520	N	0.12	1.93E-08	18.3	24.6	N
VMP-069M	Zone 5	Main Silt	13.50	14.00	-0.08	7.65E-09	20.6	0.00	N	-0.37	9.39E-09	20.9	28.0	N	0.09	6.98E-09	20.4	154	N

**TABLE X. EFFECTIVENESS MONITORING PNEUMATIC SCREENING**  
**HARTFORD PETROLEUM RELEASE SITE, HARTFORD, ILLINOIS**

Location	Effectiveness Zone	Subsurface Layer	Top of Screen (ft-bmp)	Bottom of Screen (ft-bmp)	2015Q4					2015Q3					2015Q2				
					Static Pressure/ Vacuum (in-H2O)	Estimated Soil Gas Permeability (cm2)	Oxygen (%)	TVPH (ppmv)	Screen Occlusion / Deadhead (Yes/No)	Static Pressure/ Vacuum (in-H2O)	Estimated Soil Gas Permeability (cm2)	Oxygen (%)	TVPH (ppmv)	Screen Occlusion / Deadhead (Yes/No)	Static Pressure/ Vacuum (in-H2O)	Estimated Soil Gas Permeability (cm2)	Oxygen (%)	TVPH (ppmv)	Screen Occlusion / Deadhead (Yes/No)
VMP-069VS	Zone 5	A Clay	5.50	6.00	0.00	1.79E-08	20.4	0.00	N	-0.09	2.24E-08	17.6	92.9	N	0.00	1.09E-08	19.5	512	N
VMP-070M	Zone 5	Rand	19.49	19.99	0.00	6.52E-09	0.00	700,000	N	-0.06	7.75E-09	0.10	728,000	N	0.08	5.69E-09	1.40	269,000	N
VMP-070VS	Zone 5	A Clay	4.49	4.99	0.00	--	--	--	Y	3.76	--	--	--	Y	0.13	--	--	--	Y
VMP-071S	Zone 5	N Olive	10.00	10.50	-0.06	4.24E-09	20.8	16.5	N	-1.66	9.70E-09	20.5	75.0	N	-2.42	8.03E-09	20.3	254	N
VMP-071VS	Zone 5	A Clay	5.50	6.00	-0.13	1.27E-08	20.9	0.00	N	-0.41	1.79E-08	20.8	10.0	N	-0.07	1.11E-08	20.1	2,257	N
VMP-073M	Zone 3	Main Silt	18.50	19.00	-0.05	6.05E-09	20.0	0.00	N	-0.50	8.92E-09	19.5	2.00	N	0.00	5.67E-09	20.2	0.00	N
VMP-073S	Zone 3	A Clay	7.50	8.00	-0.08	8.41E-09	15.5	0.00	N	-0.36	6.35E-09	16.1	0.00	N	0.00	4.11E-09	17.5	0.00	N
VMP-074M	Zone 4	Main Silt	14.98	15.48	-0.22	4.69E-09	19.5	28.9	N	-2.14	1.08E-08	18.6	0.00	N	1.41	3.65E-09	17.5	28.5	N
VMP-074VS	Zone 4	A Clay	5.98	6.48	0.00	1.38E-08	20.9	0.00	N	-2.10	-1.80E-08	20.7	20.0	N	-0.23	1.33E-08	20.1	12.8	N
VMP-075S	Zone 5	N Olive	13.00	13.50	0.00	7.71E-09	10.7	12.0	N	-0.05	1.05E-08	0.20	1,250	N	-0.18	7.61E-09	11.9	449	N
VMP-075VS	Zone 5	A Clay	5.00	5.50	0.00	1.70E-08	17.3	7.90	N	-0.06	2.56E-08	3.20	18,000	N	0.00	1.85E-08	13.3	315	N
VMP-076S	Zone 5	N Olive	10.51	11.01	0.00	1.04E-08	19.7	8.10	N	0.00	1.56E-08	14.9	0.00	N	-0.27	9.15E-09	19.5	53.7	N
VMP-076VS	Zone 5	A Clay	4.51	5.01	0.00	1.07E-08	22.2	5.40	N	0.00	1.19E-08	14.9	0.00	N	0.00	8.41E-09	19.0	22.8	N
VMP-078M	Zone 4	Main Silt	15.50	16.00	--	--	--	--	N	--	--	--	--	N	0.00	8.49E-09	19.2	964	N
VMP-080S	Zone 4	Main Silt	15.96	16.46	0.00	2.75E-09	6.00	0.00	N	0.00	4.02E-09	3.30	0.00	N	-0.08	3.96E-09	2.80	14.4	N
VMP-080VS	Zone 4	A Clay	4.46	4.96	0.00	1.38E-08	20.4	0.00	N	0.00	1.49E-08	19.7	0.00	N	-0.07	1.32E-08	20.3	18.5	N
VMP-081M	Zone 4	Main Silt	16.58	17.58	0.00	6.90E-09	19.2	0.00	N	-0.06	8.92E-09	16.0	0.00	N	0.26	9.24E-09	20.3	10.2	N
VMP-081S	Zone 4	A Clay	13.08	13.58	0.00	9.97E-09	19.8	0.00	N	-0.06	1.28E-08	16.6	0.00	N	-0.13	1.03E-08	20.0	17.8	N
VMP-089S	Zone 1	N Olive	14.00	14.50	-0.52	4.51E-09	20.6	0.00	N	-2.13	8.61E-09	19.9	400	N	2.87	3.21E-09	20.1	0.00	N
VMP-089VS	Zone 1	A Clay	5.50	6.00	-0.75	6.59E-09	20.9	0.00	N	-1.68	1.60E-08	20.8	0.00	N	2.32	4.95E-09	20.3	0.00	N
VMP-090VS	Zone 6	A Clay	5.48	5.98	0.00	--	--	--	Y	0.00	8.80E-10	2.50	56.4	N	-1.65	3.40E-09	4.20	134	N
VMP-093S	Zone 5	N Olive	9.51	10.01	0.00	4.04E-09	14.2	36.0	N	0.00	2.93E-09	13.4	80.0	N	-0.52	4.58E-09	16.2	162	N
VMP-094S	Zone 5	N Olive	13.48	13.98	0.00	2.54E-09	4.00	918	N	0.00	4.32E-09	1.50	500	N	-0.04	4.06E-09	1.20	0.00	N
VMP-094VS	Zone 5	A Clay	5.48	5.98	0.00	5.10E-09	1.40	100	N	0.00	5.22E-09	0.20	45.0	N	0.16	5.10E-09	0.60	0.00	N
VP-004S	Zone 6	N Olive	11.79	12.29	0.00	1.47E-09	0.80	110,000	N	0.00	3.84E-09	0.10	5,300	N	0.00	3.95E-09	4.40	0.00	N

Notes:  
 - VMP-021S, VMP-037M, VMP-037S, VMP-044S, and VMP-044VS along N Old St. Louis; VMP-062  
 - VMP-012M and VMP-012S are inaccessible due to well casing being too deep/too narrow below  
 - VMP-023S, VMP-023M, VMP-006S, VMP-007 and VP-004S well vault filled with dirt

## APPENDIX B

Date	River Stage (ft)	River Elevation (ft-amsl)
12/1/2004	11.32	406.80
12/2/2004	10.86	406.34
12/3/2004	10.36	405.84
12/4/2004	9.90	405.38
12/5/2004	9.15	404.63
12/6/2004	8.95	404.43
12/7/2004	11.68	407.16
12/8/2004	14.24	409.72
12/9/2004	13.16	408.64
12/10/2004	12.70	408.18
12/11/2004	11.44	406.92
12/12/2004	10.39	405.87
12/13/2004	10.36	405.84
12/14/2004	9.82	405.30
12/15/2004	9.68	405.16
12/16/2004	9.50	404.98
12/17/2004	9.11	404.59
12/18/2004	8.40	403.88
12/19/2004	8.75	404.23
12/20/2004	7.99	403.47
12/21/2004	7.73	403.21
12/22/2004	6.99	402.47
12/23/2004	5.31	400.79
12/24/2004	4.46	399.94
12/25/2004	5.21	400.69
12/26/2004	5.22	400.70
12/27/2004	5.27	400.75
12/28/2004	5.32	400.80
12/29/2004	5.07	400.55
12/30/2004	5.61	401.09
12/31/2004	4.81	400.29
1/1/2005	4.90	400.38
1/2/2005	4.36	399.84
1/3/2005	5.86	401.34
1/4/2005	10.68	406.16
1/5/2005	15.21	410.69
1/6/2005	21.93	417.41
1/7/2005	21.96	417.44
1/8/2005	16.93	412.41
1/9/2005	14.85	410.33
1/10/2005	13.31	408.79

Date	River Stage (ft)	River Elevation (ft-amsl)
1/11/2005	12.55	408.03
1/12/2005	12.06	407.54
1/13/2005	14.75	410.23
1/14/2005	19.18	414.66
1/15/2005	19.05	414.53
1/16/2005	15.15	410.63
1/17/2005	14.45	409.93
1/18/2005	13.03	408.51
1/19/2005	12.11	407.59
1/20/2005	12.08	407.56
1/21/2005	11.99	407.47
1/22/2005	11.78	407.26
1/23/2005	11.19	406.67
1/24/2005	11.19	406.67
1/25/2005	11.07	406.55
1/26/2005	10.73	406.21
1/27/2005	10.35	405.83
1/28/2005	9.95	405.43
1/29/2005	9.63	405.11
1/30/2005	9.72	405.20
1/31/2005	9.45	404.93
2/1/2005	9.17	404.65
2/2/2005	8.85	404.33
2/3/2005	8.26	403.74
2/4/2005	8.35	403.83
2/5/2005	8.16	403.64
2/6/2005	8.04	403.52
2/7/2005	8.73	404.21
2/8/2005	9.90	405.38
2/9/2005	9.83	405.31
2/10/2005	10.48	405.96
2/11/2005	10.94	406.42
2/12/2005	10.65	406.13
2/13/2005	10.37	405.85
2/14/2005	13.48	408.96
2/15/2005	16.93	412.41
2/16/2005	18.24	413.72
2/17/2005	18.05	413.53
2/18/2005	17.05	412.53
2/19/2005	16.71	412.19
2/20/2005	15.83	411.31

Date	River Stage (ft)	River Elevation (ft-amsl)
2/21/2005	14.64	410.12
2/22/2005	13.55	409.03
2/23/2005	13.42	408.90
2/24/2005	12.61	408.09
2/25/2005	11.38	406.86
2/26/2005	10.67	406.15
2/27/2005	10.63	406.11
2/28/2005	10.24	405.72
3/1/2005	9.28	404.76
3/2/2005	9.35	404.83
3/3/2005	9.12	404.60
3/4/2005	8.91	404.39
3/5/2005	8.30	403.78
3/6/2005	7.74	403.22
3/7/2005	7.38	402.86
3/8/2005	7.11	402.59
3/9/2005	6.42	401.90
3/10/2005	7.28	402.76
3/11/2005	7.97	403.45
3/12/2005	7.62	403.10
3/13/2005	7.28	402.76
3/14/2005	7.11	402.59
3/15/2005	6.80	402.28
3/16/2005	6.74	402.22
3/17/2005	6.06	401.54
3/18/2005	5.50	400.98
3/19/2005	5.99	401.47
3/20/2005	6.13	401.61
3/21/2005	5.26	400.74
3/22/2005	4.95	400.43
3/23/2005	5.79	401.27
3/24/2005	5.13	400.61
3/25/2005	5.57	401.05
3/26/2005	5.68	401.16
3/27/2005	5.58	401.06
3/28/2005	5.40	400.88
3/29/2005	5.43	400.91
3/30/2005	6.32	401.80
3/31/2005	6.81	402.29
4/1/2005	7.37	402.85
4/2/2005	7.59	403.07

Date	River Stage (ft)	River Elevation (ft-amsl)
4/3/2005	8.11	403.59
4/4/2005	9.39	404.87
4/5/2005	9.44	404.92
4/6/2005	9.35	404.83
4/7/2005	9.17	404.65
4/8/2005	9.28	404.76
4/9/2005	9.63	405.11
4/10/2005	9.66	405.14
4/11/2005	10.03	405.51
4/12/2005	10.52	406.00
4/13/2005	11.54	407.02
4/14/2005	13.24	408.72
4/15/2005	14.35	409.83
4/16/2005	15.09	410.57
4/17/2005	14.92	410.40
4/18/2005	14.10	409.58
4/19/2005	13.01	408.49
4/20/2005	12.06	407.54
4/21/2005	11.66	407.14
4/22/2005	11.38	406.86
4/23/2005	11.47	406.95
4/24/2005	12.40	407.88
4/25/2005	12.39	407.87
4/26/2005	12.56	408.04
4/27/2005	12.54	408.02
4/28/2005	12.24	407.72
4/29/2005	11.99	407.47
4/30/2005	11.42	406.90
5/1/2005	11.14	406.62
5/2/2005	10.67	406.15
5/3/2005	10.07	405.55
5/4/2005	9.87	405.35
5/5/2005	9.35	404.83
5/6/2005	8.80	404.28
5/7/2005	7.57	403.05
5/8/2005	6.92	402.40
5/9/2005	6.50	401.98
5/10/2005	6.41	401.89
5/11/2005	6.23	401.71
5/12/2005	6.47	401.95
5/13/2005	6.14	401.62

Date	River Stage (ft)	River Elevation (ft-amsl)
5/14/2005	7.48	402.96
5/15/2005	8.87	404.35
5/16/2005	9.11	404.59
5/17/2005	12.34	407.82
5/18/2005	11.99	407.47
5/19/2005	11.19	406.67
5/20/2005	10.72	406.20
5/21/2005	10.60	406.08
5/22/2005	10.72	406.20
5/23/2005	10.66	406.14
5/24/2005	10.27	405.75
5/25/2005	10.07	405.55
5/26/2005	10.65	406.13
5/27/2005	10.23	405.71
5/28/2005	9.75	405.23
5/29/2005	9.46	404.94
5/30/2005	9.33	404.81
5/31/2005	9.15	404.63
6/1/2005	8.77	404.25
6/2/2005	8.48	403.96
6/3/2005	8.29	403.77
6/4/2005	8.23	403.71
6/5/2005	7.85	403.33
6/6/2005	8.12	403.60
6/7/2005	10.35	405.83
6/8/2005	12.35	407.83
6/9/2005	12.43	407.91
6/10/2005	11.93	407.41
6/11/2005	12.33	407.81
6/12/2005	12.91	408.39
6/13/2005	12.27	407.75
6/14/2005	13.48	408.96
6/15/2005	14.81	410.29
6/16/2005	15.28	410.76
6/17/2005	14.14	409.62
6/18/2005	12.82	408.30
6/19/2005	12.31	407.79
6/20/2005	11.62	407.10
6/21/2005	11.20	406.68
6/22/2005	10.94	406.42
6/23/2005	10.58	406.06

Date	River Stage (ft)	River Elevation (ft-amsl)
6/24/2005	10.51	405.99
6/25/2005	10.17	405.65
6/26/2005	10.04	405.52
6/27/2005	9.74	405.22
6/28/2005	9.43	404.91
6/29/2005	9.88	405.36
6/30/2005	9.77	405.25
7/1/2005	9.74	405.22
7/2/2005	9.07	404.55
7/3/2005	9.23	404.71
7/4/2005	9.61	405.09
7/5/2005	9.44	404.92
7/6/2005	9.33	404.81
7/7/2005	9.15	404.63
7/8/2005	8.93	404.41
7/9/2005	8.95	404.43
7/10/2005	8.19	403.67
7/11/2005	7.33	402.81
7/12/2005	7.23	402.71
7/13/2005	6.69	402.17
7/14/2005	6.18	401.66
7/15/2005	5.96	401.44
7/16/2005	5.42	400.90
7/17/2005	4.97	400.45
7/18/2005	4.48	399.96
7/19/2005	4.16	399.64
7/20/2005	3.67	399.15
7/21/2005	3.71	399.19
7/22/2005	3.81	399.29
7/23/2005	3.38	398.86
7/24/2005	3.23	398.71
7/25/2005	4.30	399.78
7/26/2005	4.64	400.12
7/27/2005	4.44	399.92
7/28/2005	3.99	399.47
7/29/2005	4.65	400.13
7/30/2005	4.22	399.70
7/31/2005	3.79	399.27
8/1/2005	4.05	399.53
8/2/2005	3.97	399.45
8/3/2005	3.59	399.07

Date	River Stage (ft)	River Elevation (ft-amsl)
8/4/2005	2.63	398.11
8/5/2005	3.31	398.79
8/6/2005	2.44	397.92
8/7/2005	2.65	398.13
8/8/2005	3.32	398.80
8/9/2005	2.25	397.73
8/10/2005	2.32	397.80
8/11/2005	2.13	397.61
8/12/2005	2.12	397.60
8/13/2005	2.69	398.17
8/14/2005	3.35	398.83
8/15/2005	3.36	398.84
8/16/2005	3.46	398.94
8/17/2005	2.92	398.40
8/18/2005	2.60	398.08
8/19/2005	3.21	398.69
8/20/2005	3.57	399.05
8/21/2005	4.26	399.74
8/22/2005	4.56	400.04
8/23/2005	4.25	399.73
8/24/2005	5.02	400.50
8/25/2005	4.59	400.07
8/26/2005	4.19	399.67
8/27/2005	3.58	399.06
8/28/2005	4.47	399.95
8/29/2005	5.14	400.62
8/30/2005	5.59	401.07
8/31/2005	5.20	400.68
9/1/2005	5.30	400.78
9/2/2005	5.60	401.08
9/3/2005	4.39	399.87
9/4/2005	3.39	398.87
9/5/2005	2.78	398.26
9/6/2005	2.83	398.31
9/7/2005	2.36	397.84
9/8/2005	2.45	397.93
9/9/2005	3.19	398.67
9/10/2005	3.81	399.29
9/11/2005	3.26	398.74
9/12/2005	2.79	398.27
9/13/2005	2.41	397.89

Date	River Stage (ft)	River Elevation (ft-amsl)
9/14/2005	3.00	398.48
9/15/2005	2.65	398.13
9/16/2005	2.96	398.44
9/17/2005	3.39	398.87
9/18/2005	3.77	399.25
9/19/2005	3.19	398.67
9/20/2005	3.73	399.21
9/21/2005	3.86	399.34
9/22/2005	4.80	400.28
9/23/2005	4.47	399.95
9/24/2005	4.16	399.64
9/25/2005	4.36	399.84
9/26/2005	4.39	399.87
9/27/2005	4.37	399.85
9/28/2005	4.86	400.34
9/29/2005	5.93	401.41
9/30/2005	5.69	401.17
10/1/2005	5.10	400.58
10/2/2005	4.72	400.20
10/3/2005	4.49	399.97
10/4/2005	5.00	400.48
10/5/2005	5.17	400.65
10/6/2005	6.72	402.20
10/7/2005	8.76	404.24
10/8/2005	7.48	402.96
10/9/2005	6.68	402.16
10/10/2005	6.22	401.70
10/11/2005	6.07	401.55
10/12/2005	5.88	401.36
10/13/2005	5.85	401.33
10/14/2005	6.11	401.59
10/15/2005	6.29	401.77
10/16/2005	6.43	401.91
10/17/2005	6.29	401.77
10/18/2005	6.61	402.09
10/19/2005	6.57	402.05
10/20/2005	6.54	402.02
10/21/2005	6.94	402.42
10/22/2005	6.90	402.38
10/23/2005	6.50	401.98
10/24/2005	6.24	401.72

Date	River Stage (ft)	River Elevation (ft-amsl)
10/25/2005	5.79	401.27
10/26/2005	5.47	400.95
10/27/2005	4.77	400.25
10/28/2005	4.73	400.21
10/29/2005	4.31	399.79
10/30/2005	3.31	398.79
10/31/2005	3.02	398.50
11/1/2005	3.76	399.24
11/2/2005	3.60	399.08
11/3/2005	3.16	398.64
11/4/2005	2.72	398.20
11/5/2005	3.06	398.54
11/6/2005	3.18	398.66
11/7/2005	3.13	398.61
11/8/2005	3.18	398.66
11/9/2005	3.15	398.63
11/10/2005	3.32	398.80
11/11/2005	2.87	398.35
11/12/2005	2.62	398.10
11/13/2005	2.24	397.72
11/14/2005	2.27	397.75
11/15/2005	2.52	398.00
11/16/2005	3.27	398.75
11/17/2005	2.44	397.92
11/18/2005	2.57	398.05
11/19/2005	2.91	398.39
11/20/2005	2.70	398.18
11/21/2005	3.07	398.55
11/22/2005	3.29	398.77
11/23/2005	3.18	398.66
11/24/2005	3.12	398.60
11/25/2005	2.75	398.23
11/26/2005	2.52	398.00
11/27/2005	2.64	398.12
11/28/2005	4.11	399.59
11/29/2005	4.06	399.54
11/30/2005	3.27	398.75
12/1/2005	3.02	398.50
12/2/2005	3.60	399.08
12/3/2005	3.52	399.00
12/4/2005	3.53	399.01

Date	River Stage (ft)	River Elevation (ft-amsl)
12/5/2005	3.50	398.98
12/6/2005	3.22	398.70
12/7/2005	3.15	398.63
12/8/2005	1.33	396.81
12/9/2005	2.13	397.61
12/10/2005	1.86	397.34
12/11/2005	2.29	397.77
12/12/2005	2.77	398.25
12/13/2005	3.06	398.54
12/14/2005	3.25	398.73
12/15/2005	3.27	398.75
12/16/2005	3.31	398.79
12/17/2005	3.25	398.73
12/18/2005	3.00	398.48
12/19/2005	2.70	398.18
12/20/2005	2.63	398.11
12/21/2005	3.06	398.54
12/22/2005	3.18	398.66
12/23/2005	3.33	398.81
12/24/2005	3.94	399.42
12/25/2005	4.02	399.50
12/26/2005	3.53	399.01
12/27/2005	3.14	398.62
12/28/2005	3.44	398.92
12/29/2005	3.69	399.17
12/30/2005	3.72	399.20
12/31/2005	3.59	399.07
1/1/2006	3.44	398.92
1/2/2006	3.53	399.01
1/3/2006	4.10	399.58
1/4/2006	4.37	399.85
1/5/2006	4.49	399.97
1/6/2006	4.41	399.89
1/7/2006	4.31	399.79
1/8/2006	4.36	399.84
1/9/2006	4.68	400.16
1/10/2006	4.97	400.45
1/11/2006	4.86	400.34
1/12/2006	4.78	400.26
1/13/2006	4.87	400.35
1/14/2006	4.77	400.25

Date	River Stage (ft)	River Elevation (ft-amsl)
1/15/2006	4.49	399.97
1/16/2006	4.47	399.95
1/17/2006	4.83	400.31
1/18/2006	4.07	399.55
1/19/2006	3.71	399.19
1/20/2006	3.80	399.28
1/21/2006	4.49	399.97
1/22/2006	4.04	399.52
1/23/2006	4.15	399.63
1/24/2006	4.05	399.53
1/25/2006	3.95	399.43
1/26/2006	3.35	398.83
1/27/2006	3.37	398.85
1/28/2006	3.79	399.27
1/29/2006	3.86	399.34
1/30/2006	4.79	400.27
1/31/2006	5.21	400.69
2/1/2006	4.95	400.43
2/2/2006	4.79	400.27
2/3/2006	4.78	400.26
2/4/2006	4.78	400.26
2/5/2006	4.90	400.38
2/6/2006	4.82	400.30
2/7/2006	4.70	400.18
2/8/2006	4.67	400.15
2/9/2006	4.67	400.15
2/10/2006	4.22	399.70
2/11/2006	4.05	399.53
2/12/2006	3.78	399.26
2/13/2006	3.98	399.46
2/14/2006	3.98	399.46
2/15/2006	3.86	399.34
2/16/2006	4.22	399.70
2/17/2006	4.63	400.11
2/18/2006	4.56	400.04
2/19/2006	2.58	398.06
2/20/2006	2.75	398.23
2/21/2006	2.61	398.09
2/22/2006	2.56	398.04
2/23/2006	2.85	398.33
2/24/2006	3.40	398.88

Date	River Stage (ft)	River Elevation (ft-amsl)
2/25/2006	3.95	399.43
2/26/2006	3.84	399.32
2/27/2006	3.65	399.13
2/28/2006	3.58	399.06
3/1/2006	3.69	399.17
3/2/2006	3.72	399.20
3/3/2006	3.77	399.25
3/4/2006	3.59	399.07
3/5/2006	3.40	398.88
3/6/2006	3.32	398.80
3/7/2006	3.53	399.01
3/8/2006	3.83	399.31
3/9/2006	3.38	398.86
3/10/2006	3.64	399.12
3/11/2006	4.61	400.09
3/12/2006	5.52	401.00
3/13/2006	6.10	401.58
3/14/2006	7.59	403.07
3/15/2006	10.16	405.64
3/16/2006	6.84	402.32
3/17/2006	7.86	403.34
3/18/2006	8.14	403.62
3/19/2006	7.80	403.28
3/20/2006	7.10	402.58
3/21/2006	7.75	403.23
3/22/2006	7.31	402.79
3/23/2006	6.84	402.32
3/24/2006	6.99	402.47
3/25/2006	6.71	402.19
3/26/2006	6.59	402.07
3/27/2006	6.43	401.91
3/28/2006	6.71	402.19
3/29/2006	6.48	401.96
3/30/2006	6.17	401.65
3/31/2006	6.59	402.07
4/1/2006	6.20	401.68
4/1/2006	6.22	401.70
4/2/2006	7.30	402.78
4/3/2006	8.06	403.54
4/4/2006	9.38	404.86
4/5/2006	9.99	405.47

Date	River Stage (ft)	River Elevation (ft-amsl)
4/6/2006	9.41	404.89
4/7/2006	10.96	406.44
4/8/2006	12.08	407.56
4/9/2006	12.85	408.33
4/10/2006	12.74	408.22
4/11/2006	12.43	407.91
4/12/2006	12.50	407.98
4/13/2006	12.54	408.02
4/14/2006	12.48	407.96
4/15/2006	12.51	407.99
4/16/2006	12.48	407.96
4/17/2006	12.77	408.25
4/18/2006	12.92	408.40
4/19/2006	13.08	408.56
4/20/2006	13.15	408.63
4/21/2006	13.19	408.67
4/22/2006	13.08	408.56
4/23/2006	13.07	408.55
4/24/2006	12.98	408.46
4/25/2006	12.98	408.46
4/26/2006	12.91	408.39
4/27/2006	12.58	408.06
4/28/2006	12.27	407.75
4/29/2006	11.88	407.36
4/30/2006	11.59	407.07
5/1/2006	11.03	406.51
5/2/2006	11.12	406.60
5/3/2006	10.92	406.40
5/4/2006	12.26	407.74
5/5/2006	14.19	409.67
5/6/2006	14.10	409.58
5/7/2006	13.60	409.08
5/8/2006	12.54	408.02
5/9/2006	11.62	407.10
5/10/2006	11.36	406.84
5/11/2006	11.92	407.40
5/12/2006	11.64	407.12
5/13/2006	11.28	406.76
5/14/2006	11.57	407.05
5/15/2006	11.81	407.29
5/16/2006	11.36	406.84

Date	River Stage (ft)	River Elevation (ft-amsl)
5/17/2006	11.05	406.53
5/18/2006	10.54	406.02
5/19/2006	10.59	406.07
5/20/2006	10.63	406.11
5/21/2006	10.66	406.14
5/22/2006	10.56	406.04
5/23/2006	10.40	405.88
5/24/2006	10.41	405.89
5/25/2006	10.28	405.76
5/26/2006	10.15	405.63
5/27/2006	10.03	405.51
5/28/2006	9.45	404.93
5/29/2006	9.15	404.63
5/30/2006	8.60	404.08
5/31/2006	8.28	403.76
6/1/2006	8.43	403.91
6/2/2006	9.34	404.82
6/3/2006	10.17	405.65
6/4/2006	9.52	405.00
6/5/2006	8.85	404.33
6/6/2006	8.15	403.63
6/7/2006	7.67	403.15
6/8/2006	7.12	402.60
6/9/2006	6.50	401.98
6/10/2006	5.85	401.33
6/11/2006	5.87	401.35
6/12/2006	6.49	401.97
6/13/2006	6.73	402.21
6/14/2006	6.64	402.12
6/15/2006	6.10	401.58
6/16/2006	6.32	401.80
6/17/2006	5.74	401.22
6/18/2006	5.43	400.91
6/19/2006	5.48	400.96
6/20/2006	4.54	400.02
6/21/2006	5.03	400.51
6/22/2006	4.70	400.18
6/23/2006	4.86	400.34
6/24/2006	4.75	400.23
6/25/2006	5.05	400.53
6/26/2006	5.31	400.79

<b>Date</b>	<b>River Stage (ft)</b>	<b>River Elevation (ft-amsl)</b>
6/27/2006	5.03	400.51
6/28/2006	5.17	400.65
6/29/2006	4.99	400.47
6/30/2006	5.01	400.49
7/1/2006	5.31	400.79
7/2/2006	4.93	400.41
7/3/2006	4.02	399.50
7/4/2006	3.81	399.29
7/5/2006	3.53	399.01
7/6/2006	3.50	398.98
7/7/2006	3.78	399.26
7/8/2006	3.61	399.09
7/9/2006	2.83	398.31
7/10/2006	2.21	397.69
7/11/2006	2.22	397.70
7/12/2006	2.25	397.73
7/13/2006	2.73	398.21
7/14/2006	3.87	399.35
7/15/2006	3.56	399.04
7/16/2006	3.29	398.77
7/17/2006	3.73	399.21
7/18/2006	3.59	399.07
7/19/2006	3.38	398.86
7/20/2006	3.22	398.70
7/21/2006	3.69	399.17
7/22/2006	3.70	399.18
7/23/2006	3.53	399.01
7/24/2006	3.14	398.62
7/25/2006	3.05	398.53
7/26/2006	2.98	398.46
7/27/2006	2.96	398.44
7/28/2006	3.17	398.65
7/29/2006	3.53	399.01
7/30/2006	3.51	398.99
7/31/2006	3.02	398.50
8/1/2006	2.93	398.41
8/2/2006	2.11	397.59
8/3/2006	2.16	397.64
8/4/2006	2.33	397.81
8/5/2006	2.97	398.45
8/6/2006	3.59	399.07

Date	River Stage (ft)	River Elevation (ft-amsl)
8/7/2006	3.51	398.99
8/8/2006	3.44	398.92
8/9/2006	3.50	398.98
8/10/2006	3.49	398.97
8/11/2006	3.43	398.91
8/12/2006	3.00	398.48
8/13/2006	2.82	398.30
8/14/2006	2.46	397.94
8/15/2006	2.25	397.73
8/16/2006	2.49	397.97
8/17/2006	2.45	397.93
8/18/2006	3.08	398.56
8/19/2006	3.47	398.95
8/20/2006	3.04	398.52
8/21/2006	2.58	398.06
8/22/2006	2.67	398.15
8/23/2006	2.35	397.83
8/24/2006	2.21	397.69
8/25/2006	2.28	397.76
8/26/2006	2.46	397.94
8/27/2006	2.82	398.30
8/28/2006	3.71	399.19
8/29/2006	4.98	400.46
8/30/2006	4.38	399.86
8/31/2006	4.22	399.70
9/1/2006	4.87	400.35
9/2/2006	4.37	399.85
9/3/2006	3.84	399.32
9/4/2006	3.70	399.18
9/5/2006	3.61	399.09
9/6/2006	3.15	398.63
9/7/2006	2.98	398.46
9/8/2006	2.79	398.27
9/9/2006	3.11	398.59
9/10/2006	2.75	398.23
9/11/2006	2.61	398.09
9/12/2006	3.27	398.75
9/13/2006	3.36	398.84
9/14/2006	3.97	399.45
9/15/2006	4.08	399.56
9/16/2006	4.45	399.93

Date	River Stage (ft)	River Elevation (ft-amsl)
9/17/2006	4.49	399.97
9/18/2006	5.28	400.76
9/19/2006	4.57	400.05
9/20/2006	4.36	399.84
9/21/2006	4.08	399.56
9/22/2006	4.26	399.74
9/23/2006	4.55	400.03
9/24/2006	3.81	399.29
9/25/2006	2.84	398.32
9/26/2006	3.86	399.34
9/27/2006	3.87	399.35
9/28/2006	3.88	399.36
9/29/2006	3.93	399.41
9/30/2006	3.91	399.39
10/1/2006	3.60	399.08
10/2/2006	3.06	398.54
10/3/2006	3.17	398.65
10/4/2006	3.13	398.61
10/5/2006	2.97	398.45
10/6/2006	3.01	398.49
10/7/2006	3.27	398.75
10/8/2006	3.36	398.84
10/9/2006	3.06	398.54
10/10/2006	2.94	398.42
10/11/2006	2.71	398.19
10/12/2006	2.93	398.41
10/13/2006	2.94	398.42
10/14/2006	2.74	398.22
10/15/2006	2.69	398.17
10/16/2006	2.58	398.06
10/17/2006	3.33	398.81
10/18/2006	2.77	398.25
10/19/2006	3.08	398.56
10/20/2006	2.66	398.14
10/21/2006	2.98	398.46
10/22/2006	3.46	398.94
10/23/2006	3.30	398.78
10/24/2006	3.48	398.96
10/25/2006	3.53	399.01
10/26/2006	4.07	399.55
10/27/2006	3.86	399.34

Date	River Stage (ft)	River Elevation (ft-amsl)
10/28/2006	3.56	399.04
10/29/2006	2.99	398.47
10/30/2006	2.72	398.20
10/31/2006	3.18	398.66
11/1/2006	2.82	398.30
11/2/2006	2.91	398.39
11/3/2006	2.99	398.47
11/4/2006	2.89	398.37
11/5/2006	2.51	397.99
11/6/2006	2.12	397.60
11/7/2006	2.01	397.49
11/8/2006	2.35	397.83
11/9/2006	2.25	397.73
11/10/2006	2.22	397.70
11/11/2006	2.54	398.02
11/12/2006	2.45	397.93
11/13/2006	2.40	397.88
11/14/2006	2.60	398.08
11/15/2006	2.59	398.07
11/16/2006	3.32	398.80
11/17/2006	2.84	398.32
11/18/2006	2.65	398.13
11/19/2006	2.33	397.81
11/20/2006	2.34	397.82
11/21/2006	2.54	398.02
11/22/2006	2.52	398.00
11/23/2006	2.62	398.10
11/24/2006	2.47	397.95
11/25/2006	2.46	397.94
11/26/2006	2.46	397.94
11/27/2006	2.62	398.10
11/28/2006	2.57	398.05
11/29/2006	2.91	398.39
11/30/2006	3.48	398.96
12/1/2006	5.86	401.34
12/2/2006	5.59	401.07
12/3/2006	6.02	401.50
12/4/2006	5.68	401.16
12/5/2006	5.60	401.08
12/6/2006	5.24	400.72
12/7/2006	5.21	400.69

Date	River Stage (ft)	River Elevation (ft-amsl)
12/8/2006	4.72	400.20
12/9/2006	3.95	399.43
12/10/2006	3.63	399.11
12/11/2006	3.69	399.17
12/12/2006	4.47	399.95
12/13/2006	5.25	400.73
12/14/2006	6.16	401.64
12/15/2006	6.18	401.66
12/16/2006	6.08	401.56
12/17/2006	6.22	401.70
12/18/2006	6.51	401.99
12/19/2006	6.27	401.75
12/20/2006	5.62	401.10
12/21/2006	5.73	401.21
12/22/2006	6.26	401.74
12/23/2006	6.48	401.96
12/24/2006	6.67	402.15
12/25/2006	7.22	402.70
12/26/2006	7.60	403.08
12/27/2006	7.18	402.66
12/28/2006	6.83	402.31
12/29/2006	6.92	402.40
12/30/2006	6.85	402.33
12/31/2006	6.91	402.39
1/1/2007	6.85	402.33
1/2/2007	6.74	402.22
1/3/2007	6.66	402.14
1/4/2007	7.12	402.60
1/5/2007	7.66	403.14
1/6/2007	7.91	403.39
1/7/2007	7.99	403.47
1/8/2007	8.53	404.01
1/9/2007	8.46	403.94
1/10/2007	8.17	403.65
1/11/2007	8.05	403.53
1/12/2007	7.69	403.17
1/13/2007	8.32	403.80
1/14/2007	7.43	402.91
1/15/2007	8.22	403.70
1/16/2007	8.75	404.23
1/17/2007	7.91	403.39

Date	River Stage (ft)	River Elevation (ft-amsl)
1/18/2007	7.06	402.54
1/19/2007	6.51	401.99
1/20/2007	6.48	401.96
1/21/2007	5.98	401.46
1/22/2007	5.91	401.39
1/23/2007	5.71	401.19
1/24/2007	5.90	401.38
1/25/2007	6.04	401.52
1/26/2007	6.33	401.81
1/27/2007	6.48	401.96
1/28/2007	6.78	402.26
1/29/2007	5.22	400.70
1/30/2007	5.95	401.43
1/31/2007	5.04	400.52
2/1/2007	5.30	400.78
2/2/2007	5.53	401.01
2/3/2007	4.75	400.23
2/4/2007	4.34	399.82
2/5/2007	3.75	399.23
2/6/2007	3.73	399.21
2/7/2007	3.60	399.08
2/8/2007	3.02	398.50
2/9/2007	3.36	398.84
2/10/2007	3.05	398.53
2/11/2007	2.99	398.47
2/12/2007	2.84	398.32
2/13/2007	3.63	399.11
2/14/2007	3.33	398.81
2/15/2007	3.14	398.62
2/16/2007	3.66	399.14
2/17/2007	3.88	399.36
2/18/2007	4.41	399.89
2/19/2007	4.81	400.29
2/20/2007	4.41	399.89
2/21/2007	3.89	399.37
2/22/2007	4.91	400.39
2/23/2007	5.49	400.97
2/24/2007	7.14	402.62
2/25/2007	11.34	406.82
2/26/2007	13.10	408.58
2/27/2007	13.40	408.88

Date	River Stage (ft)	River Elevation (ft-amsl)
2/28/2007	13.81	409.29
3/1/2007	12.41	407.89
3/2/2007	12.96	408.44
3/3/2007	15.42	410.90
3/4/2007	15.70	411.18
3/5/2007	13.73	409.21
3/6/2007	12.48	407.96
3/7/2007	11.16	406.64
3/8/2007	9.90	405.38
3/9/2007	9.09	404.57
3/10/2007	9.15	404.63
3/11/2007	8.76	404.24
3/12/2007	9.38	404.86
3/13/2007	11.63	407.11
3/14/2007	11.36	406.84
3/15/2007	11.47	406.95
3/16/2007	12.01	407.49
3/17/2007	12.99	408.47
3/18/2007	13.62	409.10
3/19/2007	14.02	409.50
3/20/2007	14.46	409.94
3/21/2007	14.74	410.22
3/22/2007	15.13	410.61
3/23/2007	15.22	410.70
3/24/2007	15.62	411.10
3/25/2007	15.76	411.24
3/26/2007	16.04	411.52
3/27/2007	16.40	411.88
3/28/2007	16.52	412.00
3/29/2007	16.58	412.06
3/30/2007	16.54	412.02
3/31/2007	16.98	412.46
4/1/2007	17.47	412.95
4/2/2007	17.54	413.02
4/3/2007	17.61	413.09
4/4/2007	18.29	413.77
4/5/2007	19.07	414.55
4/6/2007	19.24	414.72
4/7/2007	18.99	414.47
4/8/2007	18.39	413.87
4/9/2007	18.14	413.62

<b>Date</b>	<b>River Stage (ft)</b>	<b>River Elevation (ft-amsl)</b>
4/10/2007	17.73	413.21
4/11/2007	17.61	413.09
4/12/2007	17.80	413.28
4/13/2007	17.96	413.44
4/14/2007	17.98	413.46
4/15/2007	18.89	414.37
4/16/2007	19.87	415.35
4/17/2007	19.63	415.11
4/18/2007	19.15	414.63
4/19/2007	18.68	414.16
4/20/2007	17.98	413.46
4/21/2007	16.99	412.47
4/22/2007	16.20	411.68
4/23/2007	15.67	411.15
4/24/2007	14.94	410.42
4/25/2007	14.10	409.58
4/26/2007	13.63	409.11
4/27/2007	13.99	409.47
4/28/2007	15.64	411.12
4/29/2007	18.16	413.64
4/30/2007	19.46	414.94
5/1/2007	19.57	415.05
5/2/2007	19.12	414.60
5/3/2007	19.07	414.55
5/4/2007	19.25	414.73
5/5/2007	19.27	414.75
5/6/2007	18.58	414.06
5/7/2007	17.78	413.26
5/8/2007	17.26	412.74
5/9/2007	19.71	415.19
5/10/2007	21.92	417.40
5/11/2007	22.74	418.22
5/12/2007	22.60	418.08
5/13/2007	22.37	417.85
5/14/2007	22.07	417.55
5/15/2007	21.75	417.23
5/16/2007	21.45	416.93
5/17/2007	20.49	415.97
5/18/2007	19.06	414.54
5/19/2007	17.43	412.91
5/20/2007	16.32	411.80

Date	River Stage (ft)	River Elevation (ft-amsl)
5/21/2007	14.68	410.16
5/22/2007	13.37	408.85
5/23/2007	12.63	408.11
5/24/2007	12.14	407.62
5/25/2007	11.58	407.06
5/26/2007	11.55	407.03
5/27/2007	11.32	406.80
5/28/2007	12.01	407.49
5/29/2007	13.60	409.08
5/30/2007	13.86	409.34
5/31/2007	13.26	408.74
6/1/2007	13.17	408.65
6/2/2007	14.27	409.75
6/3/2007	14.72	410.20
6/4/2007	15.12	410.60
6/5/2007	16.09	411.57
6/6/2007	15.28	410.76
6/7/2007	13.86	409.34
6/8/2007	13.40	408.88
6/9/2007	12.99	408.47
6/10/2007	12.90	408.38
6/11/2007	12.72	408.20
6/12/2007	13.18	408.66
6/13/2007	12.86	408.34
6/14/2007	12.22	407.70
6/15/2007	11.23	406.71
6/16/2007	11.31	406.79
6/17/2007	11.25	406.73
6/18/2007	10.32	405.80
6/19/2007	9.93	405.41
6/20/2007	9.76	405.24
6/21/2007	9.36	404.84
6/22/2007	9.20	404.68
6/23/2007	9.25	404.73
6/24/2007	11.23	406.71
6/25/2007	11.79	407.27
6/26/2007	11.27	406.75
6/27/2007	11.05	406.53
6/28/2007	10.24	405.72
6/29/2007	9.44	404.92
6/30/2007	9.48	404.96

<b>Date</b>	<b>River Stage (ft)</b>	<b>River Elevation (ft-amsl)</b>
7/1/2007	10.69	406.17
7/2/2007	10.82	406.30
7/3/2007	10.55	406.03
7/4/2007	10.04	405.52
7/5/2007	9.85	405.33
7/6/2007	10.09	405.57
7/7/2007	10.44	405.92
7/8/2007	10.65	406.13
7/9/2007	10.10	405.58

<b>Date</b>	<b>River Stage (ft)</b>	<b>River Elevation (ft-amsl)</b>
12/1/2004	8.46	403.94
12/2/2004	8.46	403.94
12/3/2004	8.46	403.94
12/4/2004	8.46	403.94
12/5/2004	8.46	403.94
12/6/2004	8.46	403.94
12/7/2004	8.47	403.95
12/8/2004	8.47	403.95
12/9/2004	8.47	403.95
12/10/2004	8.47	403.95
12/11/2004	8.47	403.95
12/12/2004	8.47	403.95
12/13/2004	8.48	403.96
12/14/2004	8.48	403.96
12/15/2004	8.48	403.96
12/16/2004	8.48	403.96
12/17/2004	8.48	403.96
12/18/2004	8.49	403.97
12/19/2004	8.49	403.97
12/20/2004	8.49	403.97
12/21/2004	8.49	403.97
12/22/2004	8.49	403.97
12/23/2004	8.49	403.97
12/24/2004	8.50	403.98
12/25/2004	8.50	403.98
12/26/2004	8.50	403.98
12/27/2004	8.50	403.98
12/28/2004	8.50	403.98
12/29/2004	8.51	403.99
12/30/2004	8.51	403.99

Date	River Stage (ft)	River Elevation (ft-amsl)
12/31/2004	8.51	403.99
1/1/2005	8.51	403.99
1/2/2005	8.51	403.99
1/3/2005	8.51	403.99
1/4/2005	8.52	404.00
1/5/2005	8.52	404.00
1/6/2005	8.52	404.00
1/7/2005	8.52	404.00
1/8/2005	8.52	404.00
1/9/2005	8.52	404.00
1/10/2005	8.53	404.01
1/11/2005	8.53	404.01
1/12/2005	8.53	404.01
1/13/2005	8.53	404.01
1/14/2005	8.53	404.01
1/15/2005	8.54	404.02
1/16/2005	8.54	404.02
1/17/2005	8.54	404.02
1/18/2005	8.54	404.02
1/19/2005	8.54	404.02
1/20/2005	8.54	404.02
1/21/2005	8.55	404.03
1/22/2005	8.55	404.03
1/23/2005	8.55	404.03
1/24/2005	8.55	404.03
1/25/2005	8.55	404.03
1/26/2005	8.56	404.04
1/27/2005	8.56	404.04
1/28/2005	8.56	404.04
1/29/2005	8.56	404.04
1/30/2005	8.56	404.04
1/31/2005	8.56	404.04
2/1/2005	8.57	404.05
2/2/2005	8.57	404.05
2/3/2005	8.57	404.05
2/4/2005	8.57	404.05
2/5/2005	8.57	404.05
2/6/2005	8.57	404.05
2/7/2005	8.58	404.06
2/8/2005	8.58	404.06
2/9/2005	8.58	404.06

<b>Date</b>	<b>River Stage (ft)</b>	<b>River Elevation (ft-amsl)</b>
2/10/2005	8.58	404.06
2/11/2005	8.58	404.06
2/12/2005	8.59	404.07
2/13/2005	8.59	404.07
2/14/2005	8.59	404.07
2/15/2005	8.59	404.07
2/16/2005	8.59	404.07
2/17/2005	8.59	404.07
2/18/2005	8.60	404.08
2/19/2005	8.60	404.08
2/20/2005	8.60	404.08
2/21/2005	8.60	404.08
2/22/2005	8.60	404.08
2/23/2005	8.60	404.08
2/24/2005	8.61	404.09
2/25/2005	8.61	404.09
2/26/2005	8.61	404.09
2/27/2005	8.61	404.09
2/28/2005	8.61	404.09
3/1/2005	8.62	404.10
3/2/2005	8.62	404.10
3/3/2005	8.62	404.10
3/4/2005	8.62	404.10
3/5/2005	8.62	404.10
3/6/2005	8.62	404.10
3/7/2005	8.63	404.11
3/8/2005	8.63	404.11
3/9/2005	8.63	404.11
3/10/2005	8.63	404.11
3/11/2005	8.63	404.11
3/12/2005	8.64	404.12
3/13/2005	8.64	404.12
3/14/2005	8.64	404.12
3/15/2005	8.64	404.12
3/16/2005	8.64	404.12
3/17/2005	8.64	404.12
3/18/2005	8.65	404.13
3/19/2005	8.65	404.13
3/20/2005	8.65	404.13
3/21/2005	8.65	404.13
3/22/2005	8.65	404.13

Date	River Stage (ft)	River Elevation (ft-amsl)
3/23/2005	8.65	404.13
11/2/2007	10.65	406.13
11/3/2007	10.32	405.80
11/4/2007	10.08	405.56
11/5/2007	9.72	405.20
11/6/2007	9.19	404.67
11/7/2007	8.77	404.25
11/8/2007	8.40	403.88
11/9/2007	7.36	402.84
11/10/2007	7.00	402.48
11/11/2007	5.32	400.80
11/12/2007	5.92	401.40
11/13/2007	6.60	402.08
11/14/2007	6.23	401.71
11/15/2007	5.87	401.35
11/16/2007	5.48	400.96
11/17/2007	5.27	400.75
11/18/2007	4.74	400.22
11/19/2007	4.68	400.16
11/20/2007	4.60	400.08
11/21/2007	4.53	400.01
11/22/2007	4.29	399.77
11/23/2007	4.47	399.95
11/24/2007	4.54	400.02
11/25/2007	4.65	400.13
11/26/2007	4.57	400.05
11/27/2007	4.54	400.02
11/28/2007	3.97	399.45
11/29/2007	4.21	399.69
11/30/2007	4.00	399.48
12/1/2007	4.02	399.50
12/2/2007	3.67	399.15
12/3/2007	3.88	399.36
12/4/2007	3.59	399.07
12/5/2007	3.43	398.91
12/6/2007	3.00	398.48
12/7/2007	3.23	398.71
12/8/2007	3.93	399.41
12/9/2007	4.16	399.64
12/10/2007	4.36	399.84
12/11/2007	3.76	399.24

Date	River Stage (ft)	River Elevation (ft-amsl)
12/12/2007	3.75	399.23
12/13/2007	4.41	399.89
12/14/2007	4.75	400.23
12/15/2007	5.47	400.95
12/16/2007	7.53	403.01
12/17/2007	7.81	403.29
12/18/2007	6.75	402.23
12/19/2007	6.31	401.79
12/20/2007	6.58	402.06
12/21/2007	6.08	401.56
12/22/2007	6.21	401.69
12/23/2007	6.50	401.98
12/24/2007	6.00	401.48
12/25/2007	5.56	401.04
12/26/2007	5.87	401.35
12/27/2007	6.79	402.27
12/28/2007	6.69	402.17
12/29/2007	6.86	402.34
12/30/2007	6.41	401.89
12/31/2007	6.78	402.26
1/1/2008	6.37	401.85
1/2/2008	4.53	400.01
1/3/2008	4.49	399.97
1/4/2008	4.51	399.99
1/5/2008	5.29	400.77
1/6/2008	5.63	401.11
1/7/2008	5.94	401.42
1/8/2008	7.75	403.23
1/9/2008	11.47	406.95
1/10/2008	12.12	407.60
1/11/2008	11.96	407.44
1/12/2008	12.35	407.83
1/13/2008	11.90	407.38
1/14/2008	11.13	406.61
1/15/2008	10.43	405.91
1/16/2008	9.01	404.49
1/17/2008	9.63	405.11
1/18/2008	9.21	404.69
1/19/2008	8.83	404.31
1/20/2008	6.99	402.47
1/21/2008	6.87	402.35

Date	River Stage (ft)	River Elevation (ft-amsl)
1/22/2008	7.16	402.64
1/23/2008	7.44	402.92
1/24/2008	7.25	402.73
1/25/2008	6.89	402.37
1/26/2008	6.66	402.14
1/27/2008	6.70	402.18
1/28/2008	6.70	402.18
1/29/2008	6.44	401.92
1/30/2008	6.21	401.69
1/31/2008	5.64	401.12
2/1/2008	6.46	401.94
2/2/2008	5.94	401.42
2/3/2008	6.66	402.14
2/4/2008	6.97	402.45
2/5/2008	7.58	403.06
2/6/2008	11.53	407.01
2/7/2008	12.51	407.99
2/8/2008	10.66	406.14
2/9/2008	11.04	406.52
2/10/2008	10.33	405.81
2/11/2008	9.10	404.58
2/12/2008	8.22	403.70
2/13/2008	8.03	403.51
2/14/2008	7.90	403.38
2/15/2008	8.94	404.42
2/16/2008	8.76	404.24
2/17/2008	8.97	404.45
2/18/2008	12.61	408.09
2/19/2008	15.31	410.79
2/20/2008	14.52	410.00
2/21/2008	12.09	407.57
2/22/2008	12.02	407.50
2/23/2008	12.15	407.63
2/24/2008	10.89	406.37
2/25/2008	10.96	406.44
2/26/2008	11.48	406.96
2/27/2008	10.23	405.71
2/28/2008	10.62	406.10
2/29/2008	10.23	405.71
3/1/2008	9.66	405.14
3/2/2008	9.67	405.15

Date	River Stage (ft)	River Elevation (ft-amsl)
3/3/2008	11.11	406.59
3/4/2008	14.00	409.48
3/5/2008	17.41	412.89
3/6/2008	19.63	415.11
3/7/2008	19.82	415.30
3/8/2008	19.22	414.70
3/9/2008	18.18	413.66
3/10/2008	16.15	411.63
3/11/2008	13.73	409.21
3/12/2008	12.54	408.02
3/13/2008	11.86	407.34
3/14/2008	11.70	407.18
3/15/2008	12.19	407.67
3/16/2008	12.81	408.29
3/17/2008	13.86	409.34
3/18/2008	14.90	410.38
3/19/2008	20.31	415.79
3/20/2008	24.07	419.55
3/21/2008	24.29	419.77
3/22/2008	23.57	419.05
3/23/2008	23.54	419.02
3/24/2008	22.62	418.10
3/25/2008	20.78	416.26
3/26/2008	18.56	414.04
3/27/2008	17.29	412.77
3/28/2008	16.90	412.38
3/29/2008	16.21	411.69
3/30/2008	15.14	410.62
3/31/2008	14.63	410.11
4/1/2008	17.25	412.73
4/2/2008	18.79	414.27
4/3/2008	17.97	413.45
4/4/2008	17.43	412.91
4/5/2008	17.56	413.04
4/6/2008	17.03	412.51
4/7/2008	16.51	411.99
4/8/2008	16.41	411.89
4/9/2008	16.33	411.81
4/10/2008	16.56	412.04
4/11/2008	21.05	416.53
4/12/2008	24.62	420.10

<b>Date</b>	<b>River Stage (ft)</b>	<b>River Elevation (ft-amsl)</b>
4/13/2008	25.35	420.83
4/14/2008	24.92	420.40
4/15/2008	24.27	419.75
4/16/2008	23.76	419.24
4/17/2008	22.85	418.33
4/18/2008	21.85	417.33
4/19/2008	21.52	417.00
4/20/2008	21.23	416.71
4/21/2008	22.08	417.56
4/22/2008	23.04	418.52
4/23/2008	23.57	419.05
4/24/2008	23.69	419.17
4/25/2008	23.65	419.13
4/26/2008	24.36	419.84
4/27/2008	24.94	420.42
4/28/2008	25.05	420.53
4/29/2008	24.95	420.43
4/30/2008	24.82	420.30
5/1/2008	24.40	419.88
5/2/2008	23.78	419.26
5/3/2008	23.53	419.01
5/4/2008	23.64	419.12
5/5/2008	23.95	419.43
5/6/2008	24.21	419.69
5/7/2008	23.93	419.41
5/8/2008	23.62	419.10
5/9/2008	24.59	420.07
5/10/2008	24.56	420.04
5/11/2008	24.52	420.00
5/12/2008	24.52	420.00
5/13/2008	24.52	420.00
5/14/2008	24.76	420.24
5/15/2008	24.40	419.88
5/16/2008	23.91	419.39
5/17/2008	23.25	418.73
5/18/2008	22.63	418.11
5/19/2008	22.11	417.59
5/20/2008	21.65	417.13
5/21/2008	20.94	416.42
5/22/2008	20.19	415.67
5/23/2008	19.44	414.92

<b>Date</b>	<b>River Stage (ft)</b>	<b>River Elevation (ft-amsl)</b>
5/24/2008	18.49	413.97
5/25/2008	17.60	413.08
5/26/2008	18.74	414.22
5/27/2008	19.92	415.40
5/28/2008	20.97	416.45
5/29/2008	19.48	414.96
5/30/2008	18.25	413.73
5/31/2008	18.38	413.86
6/1/2008	18.48	413.96
6/2/2008	18.04	413.52
6/3/2008	18.41	413.89
6/4/2008	20.27	415.75
6/5/2008	21.58	417.06
6/6/2008	22.52	418.00
6/7/2008	23.87	419.35
6/8/2008	24.05	419.53
6/9/2008	24.30	419.78
6/10/2008	24.93	420.41
6/11/2008	25.42	420.90
6/12/2008	25.97	421.45
6/13/2008	26.39	421.87
6/14/2008	26.89	422.37
6/15/2008	27.62	423.10
6/16/2008	28.76	424.24
6/17/2008	29.89	425.37
6/18/2008	30.90	426.38
6/19/2008	31.41	426.89
6/20/2008	31.55	427.03
6/21/2008	31.68	427.16
6/22/2008	31.50	426.98
6/23/2008	31.63	427.11
6/24/2008	31.94	427.42
6/25/2008	32.07	427.55
6/26/2008	32.09	427.57
6/27/2008	32.33	427.81
6/28/2008	32.73	428.21
6/29/2008	33.00	428.48
6/30/2008	33.05	428.53
7/1/2008	32.92	428.40
7/2/2008	32.53	428.01
7/3/2008	32.11	427.59

Date	River Stage (ft)	River Elevation (ft-amsl)
7/4/2008	31.63	427.11
7/5/2008	30.96	426.44
7/6/2008	29.91	425.39
7/7/2008	28.19	423.67
7/8/2008	26.20	421.68
7/9/2008	24.46	419.94
7/10/2008	23.37	418.85
7/11/2008	22.75	418.23
7/12/2008	22.00	417.48
7/13/2008	21.11	416.59
7/14/2008	20.48	415.96
7/15/2008	19.74	415.22
7/16/2008	18.86	414.34
7/17/2008	18.15	413.63
7/18/2008	17.49	412.97
7/19/2008	16.97	412.45
7/20/2008	16.32	411.80
7/21/2008	15.65	411.13
7/22/2008	15.54	411.02
7/23/2008	15.93	411.41
7/24/2008	16.93	412.41
7/25/2008	16.98	412.46
7/26/2008	17.21	412.69
7/27/2008	18.91	414.39
7/28/2008	20.20	415.68
7/29/2008	21.49	416.97
7/30/2008	22.09	417.57
7/31/2008	22.83	418.31
8/1/2008	23.86	419.34
8/2/2008	23.95	419.43
8/3/2008	23.02	418.50
8/4/2008	20.94	416.42
8/5/2008	18.07	413.55
8/6/2008	15.03	410.51
8/7/2008	13.71	409.19
8/8/2008	12.25	407.73
8/9/2008	11.82	407.30
8/10/2008	10.99	406.47
8/11/2008	10.24	405.72
8/12/2008	9.33	404.81
8/13/2008	8.01	403.49

<b>Date</b>	<b>River Stage (ft)</b>	<b>River Elevation (ft-amsl)</b>
8/14/2008	6.87	402.35
8/15/2008	7.33	402.81
8/16/2008	7.73	403.21
8/17/2008	7.06	402.54
8/18/2008	6.79	402.27
8/19/2008	6.58	402.06
8/20/2008	5.96	401.44
8/21/2008	5.93	401.41
8/22/2008	6.06	401.54
8/23/2008	5.56	401.04
8/24/2008	4.94	400.42
8/25/2008	4.30	399.78
8/26/2008	4.71	400.19
8/27/2008	4.32	399.80
8/28/2008	3.89	399.37
8/29/2008	3.87	399.35
8/30/2008	4.78	400.26
8/31/2008	4.43	399.91
9/1/2008	4.35	399.83
9/2/2008	4.25	399.73
9/3/2008	4.12	399.60
9/4/2008	4.22	399.70
9/5/2008	9.53	405.01
9/6/2008	12.95	408.43
9/7/2008	10.32	405.80
9/8/2008	8.01	403.49
9/9/2008	6.88	402.36
9/10/2008	6.50	401.98
9/11/2008	6.11	401.59
9/12/2008	7.06	402.54
9/13/2008	9.50	404.98
9/14/2008	13.90	409.38
9/15/2008	23.62	419.10
9/16/2008	27.61	423.09
9/17/2008	29.46	424.94
9/18/2008	29.86	425.34
9/19/2008	29.38	424.86
9/20/2008	27.95	423.43
9/21/2008	24.63	420.11
9/22/2008	20.46	415.94
9/23/2008	16.57	412.05

Date	River Stage (ft)	River Elevation (ft-amsl)
9/24/2008	14.45	409.93
9/25/2008	13.12	408.60
9/26/2008	12.13	407.61
9/27/2008	11.66	407.14
9/28/2008	11.21	406.69
9/29/2008	11.26	406.74
9/30/2008	11.27	406.75
10/1/2008	10.85	406.33
10/2/2008	10.21	405.69
10/3/2008	9.70	405.18
10/4/2008	9.28	404.76
10/5/2008	8.97	404.45
10/6/2008	8.30	403.78
10/7/2008	8.10	403.58
10/8/2008	8.22	403.70
10/9/2008	8.37	403.85
10/10/2008	8.00	403.48
10/11/2008	7.50	402.98
10/12/2008	6.96	402.44
10/13/2008	7.01	402.49
10/14/2008	6.46	401.94
10/15/2008	6.49	401.97
10/16/2008	6.68	402.16
10/17/2008	7.16	402.64
10/18/2008	6.98	402.46
10/19/2008	6.97	402.45
10/20/2008	6.47	401.95
10/21/2008	6.16	401.64
10/22/2008	6.16	401.64
10/23/2008	6.13	401.61
10/24/2008	6.75	402.23
10/25/2008	6.58	402.06
10/26/2008	8.15	403.63
10/27/2008	9.58	405.06
10/28/2008	9.66	405.14
10/29/2008	9.38	404.86
10/30/2008	9.00	404.48
10/31/2008	8.41	403.89
11/1/2008	7.83	403.31
11/2/2008	7.18	402.66
11/3/2008	6.82	402.30

Date	River Stage (ft)	River Elevation (ft-amsl)
11/4/2008	6.21	401.69
11/5/2008	6.27	401.75
11/6/2008	5.81	401.29
11/7/2008	5.73	401.21
11/8/2008	5.33	400.81
11/9/2008	6.37	401.85
11/10/2008	7.44	402.92
11/11/2008	7.16	402.64
11/12/2008	7.03	402.51
11/13/2008	6.95	402.43
11/14/2008	6.56	402.04
11/15/2008	6.63	402.11
11/16/2008	5.99	401.47
11/17/2008	6.34	401.82
11/18/2008	6.06	401.54
11/19/2008	6.22	401.70
11/20/2008	6.76	402.24
11/21/2008	6.56	402.04
11/22/2008	6.00	401.48
11/23/2008	5.81	401.29
11/24/2008	5.54	401.02
11/25/2008	5.30	400.78
11/26/2008	5.06	400.54
11/27/2008	4.92	400.40
11/28/2008	5.11	400.59
11/29/2008	4.72	400.20
11/30/2008	4.31	399.79
12/1/2008	4.97	400.45
12/2/2008	4.39	399.87
12/3/2008	4.10	399.58
12/4/2008	4.12	399.60
12/5/2008	4.11	399.59
12/6/2008	3.68	399.16
12/7/2008	4.04	399.52
12/8/2008	3.20	398.68
12/9/2008	3.26	398.74
12/10/2008	4.13	399.61
12/11/2008	4.04	399.52
12/12/2008	3.88	399.36
12/13/2008	4.22	399.70
12/14/2008	4.28	399.76

Date	River Stage (ft)	River Elevation (ft-amsl)
12/15/2008	5.15	400.63
12/16/2008	5.00	400.48
12/17/2008	4.78	400.26
12/18/2008	4.07	399.55
12/19/2008	5.31	400.79
12/20/2008	5.22	400.70
12/21/2008	5.77	401.25
12/22/2008	3.90	399.38
12/23/2008	4.19	399.67
12/24/2008	5.67	401.15
12/25/2008	5.66	401.14
12/26/2008	5.31	400.79
12/27/2008	5.36	400.84
12/28/2008	13.34	408.82
12/29/2008	15.82	411.30
12/30/2008	16.93	412.41
12/31/2008	17.21	412.69
1/1/2009	16.24	411.72
1/2/2009	15.31	410.79
1/3/2009	14.23	409.71
1/4/2009	13.65	409.13
1/5/2009	13.07	408.55
1/6/2009	11.63	407.11
1/7/2009	11.01	406.49
1/8/2009	10.46	405.94
1/9/2009	16.24	411.72
1/10/2009	10.05	405.53
1/11/2009	8.73	404.21
1/12/2009	8.69	404.17
1/13/2009	8.20	403.68
1/14/2009	7.08	402.56
1/15/2009	6.55	402.03
1/16/2009	5.53	401.01
1/17/2009	6.09	401.57
1/18/2009	6.47	401.95
1/19/2009	7.04	402.52
1/20/2009	6.11	401.59
1/21/2009	5.71	401.19
1/22/2009	5.52	401.00
1/23/2009	5.80	401.28
1/24/2009	5.88	401.36

Date	River Stage (ft)	River Elevation (ft-amsl)
1/25/2009	5.62	401.10
1/26/2009	5.34	400.82
1/27/2009	5.18	400.66
1/28/2009	5.03	400.51
1/29/2009	5.28	400.76
1/30/2009	5.33	400.81
1/31/2009	4.88	400.36
2/1/2009	4.96	400.44
2/2/2009	4.77	400.25
2/3/2009	4.36	399.84
2/4/2009	4.10	399.58
2/5/2009	4.20	399.68
2/6/2009	4.24	399.72
2/7/2009	4.58	400.06
2/8/2009	4.89	400.37
2/9/2009	4.31	399.79
2/10/2009	4.87	400.35
2/11/2009	8.28	403.76
2/12/2009	9.93	405.41
2/13/2009	11.83	407.31
2/14/2009	12.64	408.12
2/15/2009	12.43	407.91
2/16/2009	12.20	407.68
2/17/2009	12.19	407.67
2/18/2009	11.88	407.36
2/19/2009	11.58	407.06
2/20/2009	11.25	406.73
2/21/2009	9.91	405.39
2/22/2009	9.66	405.14
2/23/2009	8.16	403.64
2/24/2009	8.06	403.54
2/25/2009	8.31	403.79
2/26/2009	8.57	404.05
2/27/2009	8.90	404.38
2/28/2009	10.20	405.68
3/1/2009	11.16	406.64
3/2/2009	11.04	406.52
3/3/2009	10.63	406.11
3/4/2009	7.95	403.43
3/5/2009	8.70	404.18
3/6/2009	8.71	404.19

Date	River Stage (ft)	River Elevation (ft-amsl)
3/7/2009	8.26	403.74
3/8/2009	8.31	403.79
3/9/2009	9.68	405.16
3/10/2009	12.44	407.92
3/11/2009	14.43	409.91
3/12/2009	19.09	414.57
3/13/2009	21.49	416.97
3/14/2009	22.36	417.84
3/15/2009	22.61	418.09
3/16/2009	22.50	417.98
3/17/2009	21.86	417.34
3/18/2009	20.82	416.30
3/19/2009	19.43	414.91
3/20/2009	17.82	413.30
3/21/2009	16.21	411.69
3/22/2009	15.33	410.81
3/23/2009	14.77	410.25
3/24/2009	14.22	409.70
3/25/2009	14.18	409.66
3/26/2009	15.70	411.18
3/27/2009	17.45	412.93
3/28/2009	18.31	413.79
3/29/2009	19.33	414.81
3/30/2009	20.97	416.45
3/31/2009	21.76	417.24
4/1/2009	21.36	416.84
4/2/2009	20.60	416.08
4/3/2009	20.03	415.51
4/4/2009	19.28	414.76
4/5/2009	18.50	413.98
4/6/2009	17.81	413.29
4/7/2009	17.21	412.69
4/8/2009	16.75	412.23
4/9/2009	16.39	411.87
4/10/2009	16.95	412.43
4/11/2009	17.33	412.81
4/12/2009	17.75	413.23
4/13/2009	18.70	414.18
4/14/2009	19.54	415.02
4/15/2009	19.15	414.63
4/16/2009	18.42	413.90

<b>Date</b>	<b>River Stage (ft)</b>	<b>River Elevation (ft-amsl)</b>
4/17/2009	17.71	413.19
4/18/2009	16.91	412.39
4/19/2009	16.35	411.83
4/20/2009	16.02	411.50
4/21/2009	16.50	411.98
4/22/2009	16.67	412.15
4/23/2009	16.15	411.63
4/24/2009	15.63	411.11
4/25/2009	14.90	410.38
4/26/2009	14.48	409.96
4/27/2009	14.04	409.52
4/28/2009	14.26	409.74
4/29/2009	17.55	413.03
4/30/2009	21.45	416.93
5/1/2009	23.37	418.85
5/2/2009	25.18	420.66
5/3/2009	25.95	421.43
5/4/2009	26.19	421.67
5/5/2009	25.90	421.38
5/6/2009	25.21	420.69
5/7/2009	24.21	419.69
5/8/2009	23.24	418.72
5/9/2009	22.89	418.37
5/10/2009	23.43	418.91
5/11/2009	22.86	418.34
5/12/2009	22.14	417.62
5/13/2009	21.26	416.74
5/14/2009	20.04	415.52
5/15/2009	19.19	414.67
5/16/2009	19.18	414.66
5/17/2009	20.73	416.21
5/18/2009	24.16	419.64
5/19/2009	26.35	421.83
5/20/2009	27.13	422.61
5/21/2009	27.17	422.65
5/22/2009	26.45	421.93
5/23/2009	25.13	420.61
5/24/2009	23.27	418.75
5/25/2009	21.23	416.71
5/26/2009	20.58	416.06
5/27/2009	19.70	415.18

Date	River Stage (ft)	River Elevation (ft-amsl)
5/28/2009	19.08	414.56
5/29/2009	18.90	414.38
5/30/2009	18.42	413.90
5/31/2009	18.00	413.48
6/1/2009	16.91	412.39
6/2/2009	16.00	411.48
6/3/2009	15.65	411.13
6/4/2009	15.60	411.08
6/5/2009	15.33	410.81
6/6/2009	14.95	410.43
6/7/2009	14.66	410.14
6/8/2009	14.31	409.79
6/9/2009	13.59	409.07
6/10/2009	13.73	409.21
6/11/2009	14.64	410.12
6/12/2009	17.30	412.78
6/13/2009	18.74	414.22
6/14/2009	18.51	413.99
6/15/2009	16.32	411.80
6/16/2009	16.60	412.08
6/17/2009	19.20	414.68
6/18/2009	20.97	416.45
6/19/2009	21.50	416.98
6/20/2009	21.54	417.02
6/21/2009	20.76	416.24
6/22/2009	19.62	415.10
6/23/2009	18.78	414.26
6/24/2009	18.42	413.90
6/25/2009	18.66	414.14
6/26/2009	19.03	414.51
6/27/2009	18.99	414.47
6/28/2009	18.34	413.82
6/29/2009	17.20	412.68
6/30/2009	15.55	411.03
7/1/2009	14.40	409.88
7/2/2009	13.57	409.05
7/3/2009	12.65	408.13
7/4/2009	12.22	407.70
7/5/2009	14.98	410.46
7/6/2009	14.70	410.18
7/7/2009	12.78	408.26

Date	River Stage (ft)	River Elevation (ft-amsl)
7/8/2009	11.75	407.23
7/9/2009	11.33	406.81
7/10/2009	11.22	406.70
7/11/2009	10.68	406.16
7/12/2009	10.57	406.05
7/13/2009	10.93	406.41
7/14/2009	10.86	406.34
7/15/2009	10.87	406.35
7/16/2009	12.25	407.73
7/17/2009	11.91	407.39
7/18/2009	10.85	406.33
7/19/2009	8.87	404.35
7/20/2009	7.81	403.29
7/21/2009	7.47	402.95
7/22/2009	7.30	402.78
7/23/2009	7.64	403.12
7/24/2009	8.05	403.53
7/25/2009	7.96	403.44
7/26/2009	7.27	402.75
7/27/2009	7.71	403.19
7/28/2009	7.80	403.28
7/29/2009	8.51	403.99
7/30/2009	7.60	403.08
7/31/2009	7.10	402.58
8/1/2009	6.23	401.71
8/2/2009	5.57	401.05
8/3/2009	5.03	400.51
8/4/2009	4.98	400.46
8/5/2009	5.02	400.50
8/6/2009	5.07	400.55
8/7/2009	5.00	400.48
8/8/2009	4.51	399.99
8/9/2009	4.36	399.84
8/10/2009	4.80	400.28
8/11/2009	5.40	400.88
8/12/2009	6.42	401.90
8/13/2009	6.77	402.25
8/14/2009	6.61	402.09
8/15/2009	6.77	402.25
8/16/2009	6.46	401.94
8/17/2009	6.13	401.61

Date	River Stage (ft)	River Elevation (ft-amsl)
8/18/2009	8.33	403.81
8/19/2009	8.88	404.36
8/20/2009	10.29	405.77
8/21/2009	12.49	407.97
8/22/2009	13.08	408.56
8/23/2009	11.33	406.81
8/24/2009	9.29	404.77
8/25/2009	8.28	403.76
8/26/2009	8.20	403.68
8/27/2009	7.21	402.69
8/28/2009	7.68	403.16
8/29/2009	10.94	406.42
8/30/2009	13.44	408.92
8/31/2009	14.25	409.73
9/1/2009	14.78	410.26
9/2/2009	14.64	410.12
9/3/2009	13.77	409.25
9/4/2009	9.42	404.90
9/5/2009	7.45	402.93
9/6/2009	7.10	402.58
9/7/2009	6.29	401.77
9/8/2009	5.90	401.38
9/9/2009	5.51	400.99
9/10/2009	5.60	401.08
9/11/2009	5.59	401.07
9/12/2009	5.05	400.53
9/13/2009	4.77	400.25
9/14/2009	4.49	399.97
9/15/2009	4.46	399.94
9/16/2009	4.23	399.71
9/17/2009	4.45	399.93
9/18/2009	4.39	399.87
9/19/2009	3.99	399.47
9/20/2009	3.90	399.38
9/21/2009	4.63	400.11
9/22/2009	4.43	399.91
9/23/2009	3.89	399.37
9/24/2009	3.82	399.30
9/25/2009	3.93	399.41
9/26/2009	5.14	400.62
9/27/2009	6.40	401.88

Date	River Stage (ft)	River Elevation (ft-amsl)
9/28/2009	6.51	401.99
9/29/2009	5.21	400.69
9/30/2009	4.69	400.17
10/1/2009	4.86	400.34
10/2/2009	5.49	400.97
10/3/2009	4.78	400.26
10/4/2009	4.71	400.19
10/5/2009	5.09	400.57
10/6/2009	5.27	400.75
10/7/2009	5.91	401.39
10/8/2009	6.38	401.86
10/9/2009	10.22	405.70
10/10/2009	16.55	412.03
10/11/2009	15.20	410.68
10/12/2009	11.89	407.37
10/13/2009	10.37	405.85
10/14/2009	9.89	405.37
10/15/2009	10.49	405.97
10/16/2009	10.10	405.58
10/17/2009	9.52	405.00
10/18/2009	9.01	404.49
10/19/2009	8.32	403.80
10/20/2009	8.04	403.52
10/21/2009	7.84	403.32
10/22/2009	7.74	403.22
10/23/2009	9.91	405.39
10/24/2009	15.75	411.23
10/25/2009	16.83	412.31
10/26/2009	17.70	413.18
10/27/2009	18.02	413.50
10/28/2009	18.51	413.99
10/29/2009	18.02	413.50
10/30/2009	20.32	415.80
10/31/2009	24.43	419.91
11/1/2009	25.85	421.33
11/2/2009	26.30	421.78
11/3/2009	25.99	421.47
11/4/2009	25.47	420.95
11/5/2009	24.36	419.84
11/6/2009	22.63	418.11
11/7/2009	21.15	416.63

Date	River Stage (ft)	River Elevation (ft-amsl)
11/8/2009	19.97	415.45
11/9/2009	18.87	414.35
11/10/2009	18.00	413.48
11/11/2009	17.31	412.79
11/12/2009	16.57	412.05
11/13/2009	15.76	411.24
11/14/2009	14.83	410.31
11/15/2009	13.86	409.34
11/16/2009	14.38	409.86
11/17/2009	18.91	414.39
11/18/2009	20.53	416.01
11/19/2009	21.54	417.02
11/20/2009	22.57	418.05
11/21/2009	22.49	417.97
11/22/2009	20.99	416.47
11/23/2009	18.29	413.77
11/24/2009	14.99	410.47
11/25/2009	14.32	409.80
11/26/2009	13.73	409.21
11/27/2009	12.97	408.45
11/28/2009	12.89	408.37
11/29/2009	13.63	409.11
11/30/2009	13.63	409.11
12/1/2009	12.63	408.11
12/2/2009	12.21	407.69
12/3/2009	11.45	406.93
12/4/2009	11.18	406.66
12/5/2009	10.53	406.01
12/6/2009	9.86	405.34
12/7/2009	10.04	405.52
12/8/2009	9.62	405.10
12/9/2009	10.21	405.69
12/10/2009	9.13	404.61
12/11/2009	9.46	404.94
12/12/2009	8.27	403.75
12/13/2009	8.05	403.53
12/14/2009	7.13	402.61
12/15/2009	7.35	402.83
12/16/2009	6.60	402.08
12/17/2009	6.18	401.66
12/18/2009	6.47	401.95

Date	River Stage (ft)	River Elevation (ft-amsl)
12/19/2009	7.07	402.55
12/20/2009	6.77	402.25
12/21/2009	6.75	402.23
12/22/2009	6.38	401.86
12/23/2009	7.62	403.10
12/24/2009	10.32	405.80
12/25/2009	15.36	410.84
12/26/2009	17.20	412.68
12/27/2009	18.35	413.83
12/28/2009	18.55	414.03
12/29/2009	17.93	413.41
12/30/2009	16.87	412.35
12/31/2009	15.64	411.12
1/1/2010	14.64	410.12
1/2/2010	12.02	407.50
1/3/2010	8.25	403.73
1/4/2010	8.55	404.03
1/5/2010	8.35	403.83
1/7/2010	8.94	404.42
1/8/2010	8.40	403.88
1/10/2010	7.70	403.18
1/11/2010	7.85	403.33
1/12/2010	7.45	402.93
1/13/2010	7.73	403.21
1/14/2010	7.75	403.23
1/15/2010	8.27	403.75
1/16/2010	8.00	403.48
1/17/2010	7.98	403.46
1/18/2010	8.04	403.52
1/19/2010	7.92	403.40
1/20/2010	7.93	403.41
1/21/2010	8.93	404.41
1/22/2010	9.79	405.27
1/23/2010	11.93	407.41
1/24/2010	13.76	409.24
1/25/2010	19.09	414.57
1/27/2010	20.93	416.41
1/28/2010	20.08	415.56
1/29/2010	18.79	414.27
1/30/2010	16.78	412.26
1/31/2010	15.12	410.60

Date	River Stage (ft)	River Elevation (ft-amsl)
2/1/2010	12.88	408.36
2/2/2010	12.00	407.48
2/3/2010	11.43	406.91
2/4/2010	11.03	406.51
2/5/2010	10.60	406.08
2/6/2010	10.54	406.02
2/7/2010	10.32	405.80
2/8/2010	10.00	405.48
2/9/2010	9.90	405.38
2/10/2010	9.61	405.09
2/11/2010	9.48	404.96
2/12/2010	9.25	404.73
2/13/2010	9.00	404.48
2/14/2010	8.87	404.35
2/15/2010	7.93	403.41
2/16/2010	7.17	402.65
2/17/2010	7.27	402.75
2/18/2010	7.61	403.09
2/19/2010	7.36	402.84
2/20/2010	7.66	403.14
2/21/2010	7.30	402.78
2/22/2010	11.35	406.83
2/23/2010	12.79	408.27
2/24/2010	12.27	407.75
2/25/2010	10.71	406.19
2/26/2010	8.94	404.42
2/27/2010	8.79	404.27
2/28/2010	8.46	403.94
3/1/2010	7.94	403.42
3/2/2010	7.84	403.32
3/3/2010	7.59	403.07
3/4/2010	7.86	403.34
3/5/2010	8.00	403.48
3/6/2010	8.10	403.58
3/7/2010	8.30	403.78
3/8/2010	8.59	404.07
3/9/2010	10.03	405.51
3/10/2010	12.37	407.85
3/11/2010	15.07	410.55
3/12/2010	17.59	413.07
3/13/2010	19.76	415.24

Date	River Stage (ft)	River Elevation (ft-amsl)
3/14/2010	20.83	416.31
3/15/2010	21.74	417.22
3/16/2010	22.83	418.31
3/17/2010	23.78	419.26
3/18/2010	24.05	419.53
3/19/2010	24.00	419.48
3/20/2010	23.58	419.06
3/21/2010	23.02	418.50
3/22/2010	23.04	418.52
3/23/2010	23.37	418.85
3/24/2010	24.15	419.63
3/25/2010	24.69	420.17
3/26/2010	25.18	420.66
3/27/2010	25.72	421.20
3/28/2010	26.23	421.71
3/29/2010	26.57	422.05
3/30/2010	26.49	421.97
3/31/2010	25.93	421.41
4/1/2010	25.18	420.66
4/2/2010	24.12	419.60
4/3/2010	23.10	418.58
4/4/2010	23.53	419.01
4/5/2010	23.82	419.30
4/6/2010	23.49	418.97
4/7/2010	23.38	418.86
4/8/2010	23.10	418.58
4/9/2010	23.03	418.51
4/10/2010	23.18	418.66
4/11/2010	22.53	418.01
4/12/2010	21.73	417.21
4/13/2010	21.00	416.48
4/14/2010	20.48	415.96
4/15/2010	20.14	415.62
4/16/2010	19.79	415.27
4/17/2010	19.10	414.58
4/18/2010	18.22	413.70
4/19/2010	17.17	412.65
4/20/2010	16.26	411.74
4/21/2010	15.49	410.97
4/22/2010	14.75	410.23
4/23/2010	13.94	409.42

<b>Date</b>	<b>River Stage (ft)</b>	<b>River Elevation (ft-amsl)</b>
4/24/2010	13.46	408.94
4/25/2010	14.45	409.93
4/26/2010	19.19	414.67
4/27/2010	22.56	418.04
4/28/2010	23.91	419.39
4/29/2010	23.80	419.28
4/30/2010	22.66	418.14
5/1/2010	20.95	416.43
5/2/2010	18.87	414.35
5/3/2010	16.90	412.38
5/4/2010	16.07	411.55
5/5/2010	15.99	411.47
5/6/2010	15.31	410.79
5/7/2010	14.39	409.87
5/8/2010	13.93	409.41
5/9/2010	14.63	410.11
5/10/2010	14.58	410.06
5/11/2010	14.39	409.87
5/12/2010	15.57	411.05
5/13/2010	17.94	413.42
5/14/2010	20.74	416.22
5/15/2010	23.16	418.64
5/16/2010	24.88	420.36
5/17/2010	26.66	422.14
5/18/2010	27.38	422.86
5/19/2010	28.08	423.56
5/20/2010	28.12	423.60
5/21/2010	27.83	423.31
5/22/2010	27.50	422.98
5/23/2010	27.21	422.69
5/24/2010	26.55	422.03
5/25/2010	25.63	421.11
5/26/2010	24.45	419.93
5/27/2010	22.93	418.41
5/28/2010	21.50	416.98
5/29/2010	20.83	416.31
5/30/2010	20.01	415.49
5/31/2010	19.01	414.49
6/1/2010	18.05	413.53
6/2/2010	17.20	412.68
6/3/2010	16.46	411.94

Date	River Stage (ft)	River Elevation (ft-amsl)
6/4/2010	16.97	412.45
6/5/2010	18.14	413.62
6/6/2010	18.62	414.10
6/7/2010	19.05	414.53
6/8/2010	19.43	414.91
6/9/2010	19.53	415.01
6/10/2010	20.27	415.75
6/11/2010	20.73	416.21
6/12/2010	19.60	415.08
6/13/2010	19.07	414.55
6/14/2010	20.04	415.52
6/15/2010	21.48	416.96
6/16/2010	23.11	418.59
6/17/2010	24.07	419.55
6/18/2010	25.09	420.57
6/19/2010	25.63	421.11
6/20/2010	25.88	421.36
6/21/2010	26.07	421.55
6/22/2010	26.42	421.90
6/23/2010	26.87	422.35
6/24/2010	27.35	422.83
6/25/2010	27.81	423.29
6/26/2010	28.46	423.94
6/27/2010	28.78	424.26
6/28/2010	29.04	424.52
6/29/2010	28.92	424.40
6/30/2010	28.85	424.33
7/1/2010	28.60	424.08
7/2/2010	28.04	423.52
7/3/2010	27.25	422.73
7/4/2010	26.36	421.84
7/5/2010	25.57	421.05
7/6/2010	24.81	420.29
7/7/2010	24.23	419.71
7/8/2010	24.53	420.01
7/9/2010	26.19	421.67
7/10/2010	26.99	422.47
7/11/2010	27.23	422.71
7/12/2010	26.83	422.31
7/13/2010	26.13	421.61
7/14/2010	25.44	420.92

Date	River Stage (ft)	River Elevation (ft-amsl)
7/15/2010	24.88	420.36
7/16/2010	24.15	419.63
7/17/2010	23.45	418.93
7/18/2010	22.74	418.22
7/19/2010	22.31	417.79
7/20/2010	22.44	417.92
7/21/2010	22.88	418.36
7/22/2010	24.17	419.65
7/23/2010	25.53	421.01
7/24/2010	26.01	421.49
7/25/2010	25.98	421.46
7/26/2010	25.52	421.00
7/27/2010	25.08	420.56
7/28/2010	24.71	420.19
7/29/2010	24.30	419.78
7/30/2010	24.25	419.73
7/31/2010	24.68	420.16
8/1/2010	25.07	420.55
8/2/2010	25.00	420.48
8/3/2010	24.51	419.99
8/4/2010	23.91	419.39
8/5/2010	23.22	418.70
8/6/2010	22.48	417.96
8/7/2010	21.66	417.14
8/8/2010	20.94	416.42
8/9/2010	20.59	416.07
8/10/2010	20.45	415.93
8/11/2010	20.28	415.76
8/12/2010	20.11	415.59
8/13/2010	20.03	415.51
8/14/2010	20.26	415.74
8/15/2010	20.74	416.22
8/16/2010	21.09	416.57
8/17/2010	21.23	416.71
8/18/2010	21.15	416.63
8/19/2010	20.78	416.26
8/20/2010	20.35	415.83
8/21/2010	20.37	415.85
8/22/2010	20.73	416.21
8/23/2010	21.09	416.57
8/24/2010	20.72	416.20

Date	River Stage (ft)	River Elevation (ft-amsl)
8/25/2010	19.86	415.34
8/26/2010	18.82	414.30
8/27/2010	17.82	413.30
8/28/2010	16.95	412.43
8/29/2010	16.09	411.57
8/30/2010	15.28	410.76
8/31/2010	14.37	409.85
9/1/2010	13.28	408.76
9/2/2010	12.69	408.17
9/3/2010	12.97	408.45
9/4/2010	14.46	409.94
9/5/2010	14.66	410.14
9/6/2010	14.21	409.69
9/7/2010	13.57	409.05
9/8/2010	12.58	408.06
9/9/2010	11.23	406.71
9/10/2010	10.28	405.76
9/11/2010	11.05	406.53
9/12/2010	12.68	408.16
9/13/2010	12.54	408.02
9/14/2010	11.95	407.43
9/15/2010	11.20	406.68
9/16/2010	10.88	406.36
9/17/2010	10.50	405.98
9/18/2010	10.59	406.07
9/19/2010	11.18	406.66
9/20/2010	15.23	410.71
9/21/2010	16.20	411.68
9/22/2010	15.86	411.34
9/23/2010	15.76	411.24
9/24/2010	18.17	413.65
9/25/2010	19.38	414.86
9/26/2010	19.49	414.97
9/27/2010	19.50	414.98
9/28/2010	19.34	414.82
9/29/2010	18.90	414.38
9/30/2010	17.76	413.24
10/1/2010	16.62	412.10
10/2/2010	15.83	411.31
10/3/2010	15.51	410.99
10/4/2010	15.48	410.96

Date	River Stage (ft)	River Elevation (ft-amsl)
10/5/2010	15.49	410.97
10/7/2010	16.16	411.64
10/8/2010	16.45	411.93
10/9/2010	16.62	412.10
10/10/2010	16.72	412.20
10/11/2010	16.75	412.23
10/12/2010	16.54	412.02
10/13/2010	16.43	411.91
10/14/2010	16.18	411.66
10/15/2010	15.71	411.19
10/16/2010	15.24	410.72
10/17/2010	14.82	410.30
10/18/2010	14.38	409.86
10/19/2010	13.81	409.29
10/20/2010	13.18	408.66
10/21/2010	12.42	407.90
10/22/2010	11.74	407.22
10/23/2010	11.14	406.62
10/24/2010	10.49	405.97
10/25/2010	9.81	405.29
10/26/2010	9.78	405.26
10/27/2010	9.40	404.88
10/28/2010	9.30	404.78
10/29/2010	9.12	404.60
10/30/2010	9.52	405.00
10/31/2010	9.00	404.48
11/1/2010	8.19	403.67
11/2/2010	8.39	403.87
11/3/2010	8.57	404.05
11/4/2010	9.45	404.93
11/5/2010	9.29	404.77
11/6/2010	9.44	404.92
11/7/2010	9.78	405.26
11/8/2010	9.47	404.95
11/9/2010	9.72	405.20
11/10/2010	9.55	405.03
11/11/2010	9.59	405.07
11/12/2010	9.57	405.05
11/13/2010	9.62	405.10
11/14/2010	9.38	404.86
11/15/2010	9.04	404.52

Date	River Stage (ft)	River Elevation (ft-amsl)
11/16/2010	9.43	404.91
11/17/2010	10.11	405.59
11/18/2010	10.47	405.95
11/19/2010	9.82	405.30
11/20/2010	9.72	405.20
11/21/2010	9.42	404.90
11/22/2010	9.39	404.87
11/23/2010	9.65	405.13
11/24/2010	9.28	404.76
11/25/2010	11.59	407.07
11/26/2010	11.32	406.80
11/27/2010	10.61	406.09
11/28/2010	9.67	405.15
11/29/2010	9.21	404.69
11/30/2010	9.21	404.69
12/1/2010	8.35	403.83
12/2/2010	7.54	403.02
12/3/2010	7.99	403.47
12/4/2010	8.19	403.67
12/5/2010	8.18	403.66
12/6/2010	7.73	403.21
12/7/2010	6.37	401.85
12/8/2010	5.85	401.33
12/9/2010	5.22	400.70
12/10/2010	4.78	400.26
12/11/2010	4.96	400.44
12/12/2010	5.74	401.22
12/13/2010	4.80	400.28
12/14/2010	4.16	399.64
12/15/2010	4.87	400.35
12/16/2010	5.71	401.19
12/17/2010	5.87	401.35
12/18/2010	6.05	401.53
12/19/2010	5.78	401.26
12/20/2010	5.74	401.22
12/21/2010	6.17	401.65
12/22/2010	5.85	401.33
12/23/2010	5.43	400.91
12/24/2010	5.57	401.05
12/25/2010	5.91	401.39
12/26/2010	5.65	401.13

Date	River Stage (ft)	River Elevation (ft-amsl)
12/27/2010	5.44	400.92
12/28/2010	5.23	400.71
12/29/2010	5.41	400.89
12/30/2010	5.71	401.19
12/31/2010	5.81	401.29
1/1/2011	8.50	403.98
1/2/2011	8.91	404.39
1/3/2011	8.18	403.66
1/4/2011	8.08	403.56
1/5/2011	8.49	403.97
1/6/2011	8.35	403.83
1/7/2011	8.30	403.78
1/8/2011	8.29	403.77
1/9/2011	6.21	401.69
1/10/2011	6.41	401.89
1/11/2011	6.85	402.33
1/12/2011	6.09	401.57
1/13/2011	5.35	400.83
1/14/2011	6.17	401.65
1/15/2011	6.48	401.96
1/16/2011	6.71	402.19
1/17/2011	6.31	401.79
1/18/2011	5.98	401.46
1/19/2011	6.12	401.60
1/20/2011	5.73	401.21
1/21/2011	5.49	400.97
1/22/2011	5.78	401.26
1/23/2011	5.79	401.27
1/24/2011	5.72	401.20
1/25/2011	5.49	400.97
1/26/2011	5.04	400.52
1/27/2011	5.49	400.97
1/28/2011	5.44	400.92
1/29/2011	5.16	400.64
1/30/2011	5.39	400.87
1/31/2011	5.14	400.62
2/1/2011	5.04	400.52
2/2/2011	4.80	400.28
2/3/2011	4.48	399.96
2/4/2011	4.09	399.57
2/5/2011	4.44	399.92

Date	River Stage (ft)	River Elevation (ft-amsl)
2/6/2011	5.17	400.65
2/7/2011	5.54	401.02
2/8/2011	4.89	400.37
2/9/2011	4.95	400.43
2/10/2011	4.83	400.31
02/11/11	4.55	400.03
02/12/11	5.29	400.77
02/13/11	5.41	400.89
02/14/11	5.39	400.87
02/15/11	5.49	400.97
02/16/11	6.60	402.08
02/17/11	9.57	405.05
02/18/11	14.22	409.70
02/19/11	15.09	410.57
02/20/11	16.93	412.41
02/21/11	17.83	413.31
02/22/11	18.60	414.08
02/23/11	18.66	414.14
02/24/11	18.24	413.72
02/25/11	18.13	413.61
02/26/11	18.65	414.13
02/27/11	18.55	414.03
02/28/11	18.48	413.96
03/01/11	19.93	415.41
03/02/11	21.26	416.74
03/03/11	20.66	416.14
03/04/11	18.90	414.38
03/05/11	18.48	413.96
03/06/11	19.15	414.63
03/07/11	18.24	413.72
03/08/11	17.83	413.31
03/09/11	17.66	413.14
03/10/11	18.23	413.71
03/11/11	17.77	413.25
03/12/11	17.98	413.46
3/13/2011	17.84	413.32
3/14/2011	16.95	412.43
3/15/2011	16.89	412.37
3/16/2011	16.91	412.39
3/17/2011	16.78	412.26
3/18/2011	15.29	410.77

Date	River Stage (ft)	River Elevation (ft-amsl)
3/19/2011	14.16	409.64
3/20/2011	13.49	408.97
3/21/2011	13.20	408.68
3/22/2011	12.99	408.47
3/23/2011	13.26	408.74
3/24/2011	13.56	409.04
3/25/2011	14.14	409.62
3/26/2011	14.69	410.17
3/27/2011	15.26	410.74
3/28/2011	15.80	411.28
3/29/2011	16.36	411.84
3/30/2011	16.64	412.12
3/31/2011	16.66	412.14
4/1/2011	16.87	412.35
4/2/2011	17.21	412.69
4/3/2011	17.27	412.75
4/4/2011	17.45	412.93
4/5/2011	17.51	412.99
4/6/2011	17.53	413.01
4/7/2011	17.37	412.85
4/8/2011	17.14	412.62
4/9/2011	17.00	412.48
4/10/2011	17.09	412.57
4/11/2011	17.21	412.69
4/12/2011	17.71	413.19
4/13/2011	17.86	413.34
4/14/2011	17.61	413.09
4/15/2011	17.20	412.68
4/16/2011	17.25	412.73
4/17/2011	17.51	412.99
4/18/2011	18.18	413.66
4/19/2011	19.12	414.60
4/20/2011	20.62	416.10
4/21/2011	21.16	416.64
4/22/11	21.70	417.18
4/23/11	23.42	418.90
4/25/11	25.85	421.33
4/26/11	26.75	422.23
4/27/11	27.15	422.63
4/28/11	27.70	423.18
4/29/11	27.88	423.36

Date	River Stage (ft)	River Elevation (ft-amsl)
4/30/11	28.14	423.62
5/1/11	28.07	423.55
5/2/11	27.27	422.75
5/3/11	26.28	421.76
5/4/11	25.19	420.67
5/5/11	24.41	419.89
5/6/11	23.90	419.38
5/7/11	23.27	418.75
5/8/11	22.72	418.20
5/9/11	22.25	417.73
5/10/11	21.80	417.28
5/11/11	21.31	416.79
5/12/11	21.11	416.59
5/13/11	21.13	416.61
5/14/11	20.97	416.45
5/15/11	21.50	416.98
5/16/11	21.35	416.83
5/17/11	21.02	416.50
5/18/11	20.62	416.10
5/19/11	20.10	415.58
5/20/11	19.68	415.16
5/21/11	20.26	415.74
5/22/11	20.99	416.47
5/23/11	21.44	416.92
5/24/11	22.10	417.58
5/25/11	21.31	416.79
5/26/11	21.64	417.12
5/27/11	23.62	419.10
5/28/11	25.02	420.50
5/29/11	25.90	421.38
5/30/11	26.21	421.69
5/31/11	25.86	421.34
6/1/11	25.16	420.64
6/2/11	24.82	420.30
6/3/11	24.72	420.20
6/4/11	24.88	420.36
6/5/11	25.24	420.72
6/6/11	25.75	421.23
6/7/11	26.13	421.61
6/8/11	26.03	421.51
6/9/11	25.60	421.08

Date	River Stage (ft)	River Elevation (ft-amsl)
6/10/11	24.94	420.42
6/11/11	24.31	419.79
6/12/11	23.82	419.30
6/13/11	23.43	418.91
6/14/11	23.31	418.79
6/15/11	23.45	418.93
6/16/11	23.84	419.32
6/17/11	24.82	420.30
6/18/11	26.07	421.55
6/19/11	27.03	422.51
6/20/11	27.29	422.77
6/21/11	27.11	422.59
6/22/11	26.66	422.14
6/23/11	26.26	421.74
6/24/11	25.87	421.35
6/25/11	25.45	420.93
6/26/11	24.72	420.20
6/27/11	24.50	419.98
6/28/11	24.46	419.94
6/29/11	25.43	420.91
6/30/11	26.41	421.89
7/1/11	26.99	422.47
7/2/11	27.11	422.59
7/3/11	26.82	422.30
7/4/11	26.47	421.95
7/5/11	25.86	421.34
7/6/11	24.95	420.43
7/7/2011	24.25	419.73
7/8/2011	23.99	419.47
7/9/2011	23.63	419.11
7/10/2011	23.24	418.72
7/11/2011	22.85	418.33
7/12/2011	22.30	417.78
7/13/2011	21.88	417.36
7/14/2011	21.60	417.08
7/15/2011	21.15	416.63
7/16/2011	20.67	416.15
7/17/2011	20.17	415.65
7/18/2011	19.62	415.10
7/19/2011	18.48	413.96
7/20/2011	17.91	413.39

Date	River Stage (ft)	River Elevation (ft-amsl)
7/21/2011	17.17	412.65
7/22/2011	16.71	412.19
7/23/2011	16.40	411.88
7/24/2011	16.47	411.95
7/25/2011	16.53	412.01
7/26/2011	16.66	412.14
7/27/2011	17.07	412.55
7/28/2011	18.34	413.82
7/29/2011	18.54	414.02
7/30/2011	18.72	414.20
7/31/2011	18.68	414.16
8/1/2011	18.82	414.30
8/2/2011	19.35	414.83
8/3/2011	19.71	415.19
8/4/2011	19.85	415.33
8/5/2011	19.61	415.09
8/6/2011	18.89	414.37
8/7/2011	18.03	413.51
8/8/2011	17.08	412.56
8/9/2011	16.68	412.16
8/10/2011	16.08	411.56
8/11/2011	15.87	411.35
8/12/2011	15.61	411.09
8/13/2011	15.65	411.13
8/14/2011	15.47	410.95
8/15/2011	15.09	410.57
8/16/2011	14.59	410.07
8/17/2011	14.57	410.05
8/18/2011	14.67	410.15
8/19/2011	14.42	409.90
8/20/2011	14.25	409.73
8/21/2011	14.44	409.92
8/22/2011	14.09	409.57
8/25/2011	13.96	409.44
8/26/2011	14.05	409.53
8/27/2011	13.89	409.37
8/28/2011	13.30	408.78
8/29/2011	13.09	408.57
8/30/2011	12.96	408.44
8/31/2011	12.20	407.68
9/1/2011	11.84	407.32

Date	River Stage (ft)	River Elevation (ft-amsl)
9/2/2011	11.21	406.69
9/3/2011	11.01	406.49
9/4/2011	11.03	406.51
9/5/2011	10.98	406.46
9/6/2011	10.78	406.26
9/7/2011	10.94	406.42
9/8/2011	10.49	405.97
9/9/2011	10.07	405.55
9/10/2011	9.84	405.32
9/11/2011	9.68	405.16
9/12/2011	9.07	404.55
9/13/2011	8.85	404.33
9/14/2011	9.01	404.49
9/15/2011	9.39	404.87
9/16/2011	8.41	403.89
9/17/2011	8.08	403.56
9/18/2011	7.59	403.07
9/19/2011	7.50	402.98
9/20/2011	7.54	403.02
9/21/2011	8.02	403.50
9/22/2011	8.48	403.96
9/23/2011	7.99	403.47
9/24/2011	7.85	403.33
9/25/2011	7.99	403.47
9/26/2011	8.12	403.60
9/27/2011	8.17	403.65
9/28/2011	8.17	403.65
9/29/2011	8.36	403.84
9/30/2011	8.79	404.27
10/1/2011	8.87	404.35
10/2/2011	8.71	404.19
10/3/2011	8.26	403.74
10/4/2011	8.41	403.89
10/5/2011	7.86	403.34
10/6/2011	7.42	402.90
10/7/2011	6.94	402.42
10/8/2011	6.99	402.47
10/9/2011	6.91	402.39
10/10/2011	6.32	401.80
10/11/2011	5.33	400.81
10/12/2011	5.15	400.63

Date	River Stage (ft)	River Elevation (ft-amsl)
10/13/2011	5.22	400.70
10/14/2011	5.13	400.61
10/15/2011	5.03	400.51
10/16/2011	5.34	400.82
10/17/2011	5.48	400.96
10/18/2011	6.00	401.48
10/19/2011	5.60	401.08
10/20/2011	5.82	401.30
10/21/2011	5.45	400.93
10/22/2011	5.50	400.98
10/23/2011	5.24	400.72
10/24/2011	5.41	400.89
10/25/2011	5.18	400.66
10/26/2011	5.13	400.61
10/27/2011	5.33	400.81
10/28/2011	5.43	400.91
10/29/2011	5.32	400.80
10/30/2011	5.16	400.64
10/31/2011	4.77	400.25
11/1/2011	4.48	399.96
11/2/2011	4.48	399.96
11/3/2011	5.14	400.62
11/4/2011	6.20	401.68
11/5/2011	6.13	401.61
11/6/2011	5.72	401.20
11/7/2011	5.75	401.23
11/8/2011	5.24	400.72
11/9/2011	7.00	402.48
11/10/2011	6.74	402.22
11/11/2011	7.17	402.65
11/12/2011	7.06	402.54
11/13/2011	7.43	402.91
11/14/2011	7.47	402.95
11/15/2011	7.70	403.18
11/16/2011	7.98	403.46
11/17/2011	6.85	402.33
11/18/2011	6.38	401.86
11/19/2011	6.84	402.32
11/20/2011	6.50	401.98
11/21/2011	5.56	401.04
11/22/2011	6.02	401.50

Date	River Stage (ft)	River Elevation (ft-amsl)
11/23/2011	6.33	401.81
11/24/2011	5.93	401.41
11/25/2011	5.67	401.15
11/27/2011	6.13	401.61
11/28/2011	5.62	401.10
11/29/2011	6.24	401.72
11/30/2011	6.67	402.15
12/1/2011	6.42	401.90
12/2/2011	6.20	401.68
12/3/2011	6.06	401.54
12/4/2011	6.67	402.15
12/5/2011	6.65	402.13
12/6/2011	6.44	401.92
12/7/2011	6.86	402.34
12/8/2011	6.97	402.45
12/9/2011	7.53	403.01
12/10/2011	6.90	402.38
12/11/2011	6.65	402.13
12/12/2011	6.34	401.82
12/13/2011	6.13	401.61
12/14/2011	5.92	401.40
12/15/2011	6.84	402.32
12/16/2011	6.96	402.44
12/17/2011	8.52	404.00
12/18/2011	8.64	404.12
12/19/2011	9.18	404.66
12/20/2011	9.76	405.24
12/21/2011	10.18	405.66
12/22/2011	10.20	405.68
12/23/2011	9.79	405.27
12/24/2011	9.17	404.65
12/25/2011	8.61	404.09
12/26/2011	8.01	403.49
12/27/2011	7.64	403.12
12/28/2011	7.04	402.52
12/29/2011	7.05	402.53
12/30/2011	6.43	401.91
12/31/2011	6.46	401.94
1/1/12	6.96	402.44
1/2/12	6.03	401.51
1/3/12	5.61	401.09

Date	River Stage (ft)	River Elevation (ft-amsl)
1/4/12	5.40	400.88
1/5/12	5.68	401.16
1/6/12	5.31	400.79
1/7/12	5.22	400.70
1/8/12	4.62	400.10
1/9/12	4.70	400.18
1/10/12	4.85	400.33
1/11/12	5.21	400.69
1/12/12	4.75	400.23
1/13/12	5.07	400.55
1/14/12	4.52	400.00
1/15/12	4.58	400.06
1/16/12	4.12	399.60
1/17/12	3.98	399.46
1/18/12	4.38	399.86
1/19/12	4.26	399.74
1/20/12	4.21	399.69
1/21/12	4.29	399.77
1/22/12	4.08	399.56
1/23/12	4.93	400.41
1/24/12	4.50	399.98
1/25/12	3.95	399.43
1/26/12	4.56	400.04
1/27/12	5.03	400.51
1/28/12	5.23	400.71
1/29/12	4.91	400.39
1/30/12	5.02	400.50
1/31/12	5.32	400.80
2/1/2012	6.12	401.60
2/2/2012	6.32	401.80
2/3/2012	5.87	401.35
2/4/2012	6.52	402.00
2/5/2012	7.55	403.03
2/6/2012	7.22	402.70
2/7/2012	7.73	403.21
2/8/2012	8.09	403.57
2/9/2012	7.60	403.08
2/10/2012	7.29	402.77
2/11/2012	7.11	402.59
2/12/2012	6.38	401.86
2/13/2012	5.49	400.97

Date	River Stage (ft)	River Elevation (ft-amsl)
2/14/2012	5.40	400.88
2/15/2012	5.50	400.98
2/16/2012	5.78	401.26
2/18/2012	5.78	401.26
2/19/2012	6.13	401.61
2/20/2012	5.71	401.19
2/21/2012	5.63	401.11
2/22/2012	5.15	400.63
2/23/2012	5.59	401.07
2/24/2012	6.11	401.59
2/25/2012	5.80	401.28
2/26/2012	5.48	400.96
2/27/2012	5.99	401.47
2/28/2012	5.51	400.99
2/29/2012	6.32	401.80
3/1/2012	5.86	401.34
3/2/2012	5.97	401.45
3/3/2012	6.55	402.03
3/4/2012	6.68	402.16
3/5/2012	7.36	402.84
3/6/2012	8.66	404.14
3/7/2012	8.49	403.97
3/8/2012	8.36	403.84
3/9/2012	7.74	403.22
3/10/2012	6.98	402.46
3/11/2012	6.40	401.88
3/12/2012	6.95	402.43
3/13/2012	7.24	402.72
3/14/2012	7.99	403.47
3/15/2012	8.28	403.76
3/16/2012	9.01	404.49
3/17/2012	9.77	405.25
3/18/2012	9.87	405.35
3/19/2012	10.16	405.64
3/20/2012	9.33	404.81
3/21/2012	9.26	404.74
3/22/2012	9.89	405.37
3/23/2012	13.08	408.56
3/24/2012	14.39	409.87
3/25/2012	14.57	410.05
3/26/2012	14.56	410.04

Date	River Stage (ft)	River Elevation (ft-amsl)
3/27/2012	14.43	409.91
3/28/2012	13.44	408.92
3/29/2012	11.92	407.40
3/30/2012	11.20	406.68
3/31/2012	10.86	406.34
4/1/2012	11.02	406.50
4/2/2012	11.17	406.65
4/3/2012	11.11	406.59
4/4/2012	11.19	406.67
4/5/2012	10.82	406.30
4/6/2012	9.84	405.32
4/10/2012	8.05	403.53
4/11/2012	7.80	403.28
4/12/2012	7.50	402.98
4/13/2012	7.03	402.51
4/14/2012	7.01	402.49
4/15/2012	10.21	405.69
4/16/2012	12.30	407.78
4/17/2012	11.90	407.38
4/20/2012	13.22	408.70
4/21/2012	11.93	407.41
4/22/2012	11.14	406.62
4/23/2012	10.63	406.11
4/24/2012	10.42	405.90
4/25/2012	10.01	405.49
4/26/2012	9.62	405.10
4/27/2012	9.18	404.66
4/28/2012	9.60	405.08
4/29/2012	9.93	405.41
4/30/2012	9.96	405.44
5/1/2012	11.56	407.04
5/2/2012	12.90	408.38
5/3/2012	13.91	409.39
5/4/2012	12.87	408.35
5/5/2012	12.71	408.19
5/6/2012	14.63	410.11
5/7/2012	15.62	411.10
5/8/2012	15.45	410.93
5/9/2012	15.26	410.74
5/10/2012	15.31	410.79
5/11/2012	14.94	410.42

<b>Date</b>	<b>River Stage (ft)</b>	<b>River Elevation (ft-amsl)</b>
5/12/2012	14.60	410.08
5/13/2012	13.81	409.29
5/14/2012	13.31	408.79
5/15/2012	12.99	408.47
5/16/2012	12.89	408.37
5/23/2012	10.97	406.45
5/24/2012	10.62	406.10
5/25/2012	9.85	405.33
5/26/2012	8.10	403.58
5/27/2012	7.23	402.71
5/28/2012	6.92	402.40
5/29/2012	7.75	403.23
5/30/2012	7.58	403.06
5/31/2012	7.38	402.86
6/1/2012	8.00	403.48
6/2/2012	8.12	403.60
6/3/2012	8.51	403.99
6/4/2012	8.49	403.97
6/5/2012	9.25	404.73
6/6/2012	9.24	404.72
6/7/2012	9.65	405.13
6/8/2012	9.60	405.08
6/9/2012	9.48	404.96
6/10/2012	9.31	404.79
6/11/2012	9.37	404.85
6/12/2012	9.46	404.94
6/13/2012	9.39	404.87
6/14/2012	9.31	404.79
6/15/2012	9.45	404.93
6/16/2012	9.28	404.76
6/17/2012	9.27	404.75
6/18/2012	8.97	404.45
6/19/2012	9.00	404.48
6/20/2012	8.30	403.78
6/21/2012	7.24	402.72
6/22/2012	7.59	403.07
6/23/2012	7.62	403.10
6/24/2012	7.62	403.10
6/25/2012	7.70	403.18
6/26/2012	7.51	402.99
6/27/2012	7.43	402.91

Date	River Stage (ft)	River Elevation (ft-amsl)
6/28/2012	7.50	402.98
6/29/2012	8.12	403.60
6/30/2012	7.97	403.45
7/1/2012	8.11	403.59
7/2/2012	8.94	404.42
7/3/2012	8.51	403.99
7/4/2012	8.50	403.98
7/5/2012	7.89	403.37
7/6/2012	7.98	403.46
7/7/2012	8.17	403.65
7/8/2012	8.11	403.59
7/9/2012	7.76	403.24
7/10/2012	7.05	402.53
7/11/2012	6.72	402.20
7/12/2012	5.90	401.38
7/13/2012	6.08	401.56
7/14/2012	5.07	400.55
7/15/2012	5.06	400.54
7/16/2012	4.78	400.26
7/17/2012	4.71	400.19
7/18/2012	4.49	399.97
7/19/2012	4.62	400.10
7/20/2012	4.12	399.60
7/21/2012	3.86	399.34
7/22/2012	4.19	399.67
7/23/2012	4.43	399.91
7/24/2012	3.65	399.13
7/25/2012	3.47	398.95
7/26/2012	3.43	398.91
7/27/2012	3.47	398.95
7/28/2012	3.47	398.95
7/30/2012	3.82	399.30
7/31/2012	3.66	399.14
8/1/2012	3.56	399.04
8/2/2012	3.41	398.89
8/3/2012	3.14	398.62
8/4/2012	3.01	398.49
8/5/2012	2.62	398.10
8/6/2012	2.78	398.26
8/7/2012	2.93	398.41
8/8/2012	3.28	398.76

Date	River Stage (ft)	River Elevation (ft-amsl)
8/9/2012	3.28	398.76
8/10/2012	2.96	398.44
8/11/2012	2.32	397.80
8/12/2012	2.30	397.78
8/13/2012	2.23	397.71
8/14/2012	2.36	397.84
8/15/2012	2.50	397.98
8/16/2012	2.43	397.91
8/17/2012	2.43	397.91
8/18/2012	2.49	397.97
8/19/2012	2.52	398.00
8/20/2012	2.54	398.02
8/21/2012	2.51	397.99
8/22/2012	2.43	397.91
8/23/2012	2.49	397.97
8/24/2012	2.49	397.97
8/25/2012	2.31	397.79
8/26/2012	1.90	397.38
8/27/2012	2.29	397.77
8/28/2012	2.64	398.12
8/29/2012	2.92	398.40
8/30/2012	2.91	398.39
8/31/2012	2.94	398.42
9/1/2012	3.39	398.87
9/2/2012	4.41	399.89
9/3/2012	3.77	399.25
9/4/2012	2.83	398.31
9/5/2012	2.85	398.33
9/6/2012	2.74	398.22
9/7/2012	2.42	397.90
9/8/2012	2.80	398.28
9/9/2012	3.00	398.48
9/10/2012	2.62	398.10
9/11/2012	2.36	397.84
9/12/2012	1.80	397.28
9/13/2012	1.55	397.03
9/14/2012	1.59	397.07
9/15/2012	1.68	397.16
9/16/2012	1.73	397.21
9/17/2012	1.74	397.22
9/18/2012	2.51	397.99

Date	River Stage (ft)	River Elevation (ft-amsl)
9/19/2012	2.40	397.88
9/20/2012	1.92	397.40
9/21/2012	1.94	397.42
9/22/2012	1.90	397.38
9/23/2012	1.86	397.34
9/24/2012	1.84	397.32
9/25/2012	1.73	397.21
9/26/2012	2.07	397.55
9/27/2012	1.98	397.46
9/28/2012	1.96	397.44
9/29/2012	1.98	397.46
9/30/2012	1.91	397.39
10/1/2012	1.82	397.30
10/2/2012	1.77	397.25
10/3/2012	1.86	397.34
10/4/2012	1.80	397.28
10/5/2012	1.81	397.29
10/6/2012	1.84	397.32
10/7/2012	1.94	397.42
10/8/2012	1.99	397.47
10/9/2012	1.47	396.95
10/10/2012	1.38	396.86
10/11/2012	1.38	396.86
10/12/2012	1.32	396.80
10/13/2012	1.50	396.98
10/14/2012	2.37	397.85
10/15/2012	3.33	398.81
10/16/2012	3.75	399.23
10/17/2012	3.40	398.88
10/18/2012	2.99	398.47
10/19/2012	2.42	397.90
10/20/2012	2.76	398.24
10/21/2012	3.02	398.50
10/22/2012	3.05	398.53
10/23/2012	3.52	399.00
10/24/2012	3.52	399.00
10/25/2012	3.15	398.63
10/26/2012	3.26	398.74
10/27/2012	3.36	398.84
10/28/2012	3.18	398.66
10/29/2012	3.23	398.71

Date	River Stage (ft)	River Elevation (ft-amsl)
10/30/2012	3.28	398.76
10/31/2012	3.30	398.78
11/1/2012		398.39
11/2/2012		398.42
11/3/2012		398.41
11/4/2012		398.41
11/5/2012		398.27
11/6/2012		398.24
11/7/2012		398.24
11/8/2012		398.30
11/9/2012		398.28
11/10/2012		398.29
11/11/2012		398.12
11/12/2012		398.04
11/13/2012		398.14
11/14/2012		398.62
11/15/2012		399.14
11/16/2012		399.18
11/17/2012		398.77
11/18/2012		398.47
11/19/2012		398.44
11/20/2012		398.35
11/21/2012		398.44
11/22/2012		398.64
11/23/2012		398.78
11/24/2012		398.50
11/25/2012		398.11
11/26/2012		398.12
11/27/2012		398.36
11/28/2012		398.47
11/29/2012		398.39
11/30/2012		398.37
12/1/2012		397.98
12/2/2012		397.66
12/3/2012		397.73
12/4/2012		397.89
12/5/2012		398.09
12/6/2012		398.19
12/7/2012		397.83
12/8/2012		397.73
12/9/2012		398.02

Date	River Stage (ft)	River Elevation (ft-amsl)
12/10/2012		398.03
12/11/2012		397.96
12/12/2012		397.87
12/13/2012		397.77
12/14/2012		397.53
12/15/2012		397.38
12/16/2012		397.25
12/17/2012		397.25
12/18/2012		397.43
12/19/2012		
12/20/2012		
12/21/2012		
12/22/2012		
12/23/2012		
12/24/2012		
12/25/2012		
12/26/2012		
12/27/2012		
12/28/2012		
12/29/2012		
12/30/2012		
12/31/2012		
1/1/2013	1.31	396.79
1/2/2013	1.41	396.89
1/3/2013	1.72	397.20
1/4/2013	1.96	397.44
1/5/2013	1.79	397.27
1/6/2013	1.75	397.23
1/7/2013	1.75	397.23
1/8/2013	1.63	397.11
1/9/2013	1.93	397.41
1/10/2013	2.28	397.76
1/11/2013	2.40	397.88
1/12/2013	2.24	397.72
1/13/2013	2.42	397.90
1/14/2013	2.59	398.07
1/15/2013	2.90	398.38
1/16/2013	2.94	398.42
1/17/2013	2.75	398.23
1/18/2013	2.61	398.09
1/19/2013	2.23	397.71

Date	River Stage (ft)	River Elevation (ft-amsl)
1/20/2013	2.17	397.65
1/21/2013	2.38	397.86
1/22/2013	2.21	397.69
1/23/2013	1.64	397.12
1/24/2013	1.60	397.08
1/25/2013	1.56	397.04
1/26/2013	1.78	397.26
1/27/2013	1.91	397.39
1/28/2013	1.91	397.39
1/29/2013	2.31	397.79
1/30/2013	3.17	398.65
1/31/2013	5.74	401.22
2/1/2013	4.74	400.22
2/2/2013	4.49	399.97
2/3/2013	5.21	400.69
2/4/2013	5.07	400.55
2/5/2013	4.96	400.44
2/6/2013	4.97	400.45
2/7/2013	4.57	400.05
2/8/2013	4.43	399.91
2/9/2013	4.36	399.84
2/10/2013	4.99	400.47
2/11/2013	5.32	400.80
2/12/2013	5.21	400.69
2/13/2013	6.52	402.00
2/14/2013	6.86	402.34
2/15/2013	6.94	402.42
2/16/2013	6.30	401.78
2/17/2013	5.82	401.30
2/18/2013	5.47	400.95
2/19/2013	5.38	400.86
2/20/2013	4.49	399.97
2/21/2013	4.10	399.58
2/22/2013	3.78	399.26
2/23/2013	3.54	399.02
2/24/2013	3.41	398.89
2/25/2013	3.56	399.04
2/26/2013	4.32	399.80
2/27/2013	5.50	400.98
2/28/2013	5.16	400.64
3/1/2013	4.71	400.19

Date	River Stage (ft)	River Elevation (ft-amsl)
3/2/2013	5.14	400.62
3/3/2013	4.47	399.95
3/4/2013	4.52	400.00
3/5/2013	4.90	400.38
3/6/2013	4.55	400.03
3/7/2013	3.98	399.46
3/8/2013	4.68	400.16
3/9/2013	5.24	400.72
3/10/2013	7.29	402.77
3/11/2013	14.32	409.80
3/12/2013	18.07	413.55
3/13/2013	19.82	415.30
3/14/2013	19.83	415.31
3/15/2013	19.31	414.79
3/16/2013	18.60	414.08
3/17/2013	17.88	413.36
3/18/2013	17.08	412.56
3/19/2013	16.22	411.70
3/20/2013	15.27	410.75
3/21/2013	14.23	409.71
3/22/2013	13.06	408.54
3/23/2013	11.84	407.32
3/24/2013	11.51	406.99
3/25/2013	11.34	406.82
3/26/2013	10.00	405.48
3/27/2013	8.89	404.37
3/28/2013	9.34	404.82
3/29/2013	10.39	405.87
3/30/2013	10.46	405.94
3/31/2013	10.02	405.50
4/1/2013	9.50	404.98
4/2/2013	9.29	404.77
4/3/2013	10.20	405.68
4/4/2013	10.72	406.20
4/5/2013	11.31	406.79
4/6/2013	10.93	406.41
4/7/2013	11.46	406.94
4/8/2013	11.12	406.60
4/9/2013	11.04	406.52
4/10/2013	11.28	406.76
4/11/2013	12.83	408.31

Date	River Stage (ft)	River Elevation (ft-amsl)
4/12/2013	16.93	412.41
4/13/2013	18.46	413.94
4/14/2013	19.17	414.65
4/15/2013	18.68	414.16
4/16/2013	17.88	413.36
4/17/2013	19.16	414.64
4/18/2013	19.93	415.41
4/19/2013	22.07	417.55
4/20/2013	25.29	420.77
4/21/2013	27.62	423.10
4/22/2013	29.09	424.57
4/23/2013	29.99	425.47
4/24/2013	30.42	425.90
4/25/2013	30.58	426.06
4/26/2013	30.07	425.55
4/27/2013	29.33	424.81
4/28/2013	28.74	424.22
4/29/2013	28.33	423.81
4/30/2013	27.88	423.36
5/1/2013	27.27	422.75
5/2/2013	26.44	421.92
5/3/2013	25.63	421.11
5/4/2013	26.25	421.73
5/5/2013	26.38	421.86
5/6/2013	26.18	421.66
5/7/2013	26.36	421.84
5/8/2013	26.65	422.13
5/9/2013	26.10	421.58
5/10/2013	25.39	420.87
5/11/2013	24.59	420.07
5/12/2013	24.07	419.55
5/13/2013	23.61	419.09
5/14/2013	22.94	418.42
5/15/2013	22.27	417.75
5/16/2013	21.93	417.41
5/17/2013	21.42	416.90
5/18/2013	21.35	416.83
5/19/2013	20.90	416.38
5/20/2013	20.54	416.02
5/21/2013	21.20	416.68
5/23/2013	21.36	416.84

Date	River Stage (ft)	River Elevation (ft-amsl)
5/24/2013	20.85	416.33
5/25/2013	19.65	415.13
5/26/2013	18.46	413.94
5/27/2013	17.60	413.08
5/28/2013	18.19	413.67
5/29/2013	20.49	415.97
5/30/2013	22.65	418.13
5/31/2013	24.82	420.30
6/1/2013	28.70	424.18
6/2/2013	31.30	426.78
6/3/2013	33.51	428.99
6/4/2013	34.13	429.61
6/5/2013	33.97	429.45
6/6/2013	33.38	428.86
6/7/2013	32.53	428.01
6/8/2013	30.97	426.45
6/9/2013	29.59	425.07
6/10/2013	28.61	424.09
6/11/2013	27.69	423.17
6/12/2013	26.87	422.35
6/13/2013	26.07	421.55
6/14/2013	25.51	420.99
6/15/2013	24.88	420.36
6/16/2013	24.05	419.53
6/17/2013	22.47	417.95
6/18/2013	23.10	418.58
6/19/2013	23.65	419.13
6/20/2013	23.34	418.82
6/21/2013	22.60	418.08
6/22/2013	21.39	416.87
6/23/2013	20.39	415.87
6/24/2013	19.83	415.31
6/25/2013	18.96	414.44
6/26/2013	18.47	413.95
6/27/2013	18.06	413.54
6/28/2013	17.78	413.26
6/29/2013	17.83	413.31
6/30/2013	18.25	413.73
7/1/2013	18.79	414.27
7/2/2013	19.25	414.73
7/3/2013	19.89	415.37

Date	River Stage (ft)	River Elevation (ft-amsl)
7/4/2013	20.11	415.59
7/5/2013	20.20	415.68
7/6/2013	20.21	415.69
7/7/2013	20.12	415.60
7/8/2013	19.77	415.25
7/9/2013	19.31	414.79
7/10/2013	18.82	414.30
7/11/2013	18.32	413.80
7/12/2013	17.88	413.36
7/13/2013	17.07	412.55
7/14/2013	16.03	411.51
7/15/2013	15.21	410.69
7/16/2013	14.46	409.94
7/17/2013	13.90	409.38
7/18/2013	13.18	408.66
7/19/2013	12.58	408.06
7/20/2013	11.75	407.23
7/21/2013	10.88	406.36
7/22/2013	10.38	405.86
7/23/2013	9.46	404.94
7/24/2013	8.94	404.42
7/25/2013	7.99	403.47
7/26/2013	7.87	403.35
7/27/2013	8.00	403.48
7/28/2013	6.60	402.08
7/29/2013	6.05	401.53
7/30/2013	5.84	401.32
7/31/2013	6.54	402.02
8/1/2013	6.23	401.71
8/2/2013	4.41	399.89
8/3/2013	4.97	400.45
8/4/2013	5.00	400.48
8/5/2013	4.69	400.17
8/6/2013	5.09	400.57
8/7/2013	4.73	400.21
8/8/2013	6.42	401.90
8/9/2013	10.44	405.92
8/10/2013	12.16	407.64
8/11/2013	11.40	406.88
8/12/2013	9.44	404.92
8/13/2013	7.86	403.34

<b>Date</b>	<b>River Stage (ft)</b>	<b>River Elevation (ft-amsl)</b>
8/14/2013	7.65	403.13
8/15/2013	7.03	402.51
8/16/2013	5.88	401.36
8/17/2013	5.02	400.50
8/18/2013	5.04	400.52
8/19/2013	4.85	400.33
8/20/2013	4.76	400.24
8/21/2013	4.73	400.21
8/22/2013	4.59	400.07
8/23/2013	4.19	399.67
8/24/2013	4.56	400.04
8/25/2013	4.41	399.89
8/26/2013	4.28	399.76
8/27/2013	4.05	399.53
8/28/2013	3.66	399.14
8/29/2013	3.24	398.72
8/30/2013	2.84	398.32
8/31/2013	3.06	398.54
9/1/2013	3.00	398.48
9/2/2013	3.40	398.88
9/3/2013	3.09	398.57
9/4/2013	2.71	398.19
9/5/2013	2.53	398.01
9/6/2013	2.49	397.97
9/7/2013	2.62	398.10
9/8/2013	2.81	398.29
9/9/2013	2.98	398.46
9/10/2013	2.97	398.45
9/11/2013	2.47	397.95
9/12/2013	2.50	397.98
9/13/2013	2.77	398.25
9/14/2013	2.91	398.39
9/15/2013	2.84	398.32
9/16/2013	2.58	398.06
9/17/2013	2.10	397.58
9/18/2013	2.69	398.17
9/19/2013	2.65	398.13
9/20/2013	2.71	398.19
9/21/2013	2.67	398.15
9/22/2013	3.05	398.53
9/23/2013	3.00	398.48

Date	River Stage (ft)	River Elevation (ft-amsl)
9/24/2013	2.99	398.47
9/25/2013	3.03	398.51
9/26/2013	2.88	398.36
9/27/2013	2.67	398.15
9/28/2013	2.61	398.09
9/29/2013	2.51	397.99
9/30/2013	2.22	397.70
10/1/2013	2.11	397.59
10/2/2013	2.05	397.53
10/3/2013	2.02	397.50
10/4/2013	2.15	397.63
10/5/2013	2.16	397.64
10/6/2013	2.77	398.25
10/7/2013	3.02	398.50
10/8/2013	3.46	398.94
10/9/2013	3.27	398.75
10/10/2013	3.42	398.90
10/11/2013	3.58	399.06
10/12/2013	3.84	399.32
10/13/2013	3.90	399.38
10/14/2013	3.61	399.09
10/15/2013	3.26	398.74
10/16/2013	3.10	398.58
10/17/2013	2.40	397.88
10/18/2013	2.35	397.83
10/19/2013	2.72	398.20
10/20/2013	2.86	398.34
10/21/2013	2.94	398.42
10/22/2013	3.47	398.95
10/23/2013	4.07	399.55
10/24/2013	3.95	399.43
10/25/2013	3.72	399.20
10/26/2013	2.92	398.40
10/27/2013	2.93	398.41
10/28/2013	3.33	398.81
10/29/2013	3.39	398.87
10/30/2013	3.45	398.93
10/31/2013	3.57	399.05
11/1/2013	4.11	399.59
11/2/2013	4.68	400.16
11/3/2013	4.14	399.62

Date	River Stage (ft)	River Elevation (ft-amsl)
11/4/2013	3.91	399.39
11/5/2013	4.17	399.65
11/6/2013	4.30	399.78
11/7/2013	4.02	399.50
11/8/2013	4.16	399.64
11/9/2013	4.30	399.78
11/10/2013	4.50	399.98
11/11/2013	4.58	400.06
11/12/2013	4.31	399.79
11/13/2013	4.28	399.76
11/14/2013	4.24	399.72
11/15/2013	4.42	399.90
11/16/2013	4.18	399.66
11/17/2013	3.73	399.21
11/18/2013	3.57	399.05
11/19/2013	3.70	399.18
11/20/2013	4.04	399.52
11/21/2013	3.85	399.33
11/22/2013	3.85	399.33
11/23/2013	4.05	399.53
11/24/2013	4.25	399.73
11/25/2013	4.40	399.88
11/26/2013	4.41	399.89
11/27/2013	3.86	399.34
11/28/2013	3.01	398.49
11/29/2013	2.79	398.27
11/30/2013	2.80	398.28
12/1/2013	2.70	398.18
12/2/2013	2.59	398.07
12/3/2013	3.10	398.58
12/4/2013	2.87	398.35
12/5/2013	2.85	398.33
12/6/2013	2.69	398.17
12/7/2013	2.96	398.44
12/8/2013	2.84	398.32
12/9/2013	2.62	398.10
12/10/2013	2.31	397.79
12/11/2013	2.01	397.49
12/12/2013	1.97	397.45
12/13/2013	1.44	396.92
12/14/2013	1.60	397.08

Date	River Stage (ft)	River Elevation (ft-amsl)
12/15/2013	2.10	397.58
12/16/2013	2.07	397.55
12/17/2013	2.14	397.62
12/18/2013	2.22	397.70
12/19/2013	2.29	397.77
12/20/2013	2.35	397.83
12/21/2013	2.53	398.01
12/22/2013	3.03	398.51
12/23/2013	2.75	398.23
12/24/2013	2.34	397.82
12/25/2013	1.99	397.47
12/26/2013	2.89	398.37
12/27/2013	3.07	398.55
12/28/2013	3.24	398.72
12/29/2013	2.99	398.47
12/30/2013	2.82	398.30
12/31/2013	2.24	397.72
1/1/2014	2.36	397.84
1/2/2014	2.74	398.22
1/3/2014	2.18	397.66
1/4/2014	1.91	397.39
1/5/2014	2.03	397.51
1/6/2014	2.01	397.49
1/7/2014	2.01	397.49
1/8/2014	1.93	397.41
1/9/2014	2.35	397.83
1/10/2014	3.29	398.77
1/11/2014	3.04	398.52
1/12/2014	2.80	398.28
1/13/2014	2.70	398.18
1/14/2014	3.13	398.61
1/15/2014	3.40	398.88
1/16/2014	3.38	398.86
1/17/2014	3.67	399.15
1/18/2014	3.43	398.91
1/19/2014	3.76	399.24
1/20/2014	3.65	399.13
1/21/2014	3.89	399.37
1/22/2014	2.88	398.36
1/23/2014	2.97	398.45
1/24/2014	2.57	398.05

Date	River Stage (ft)	River Elevation (ft-amsl)
1/25/2014	2.74	398.22
1/26/2014	3.09	398.57
1/27/2014	2.97	398.45
1/28/2014	2.20	397.68
1/29/2014	2.19	397.67
1/30/2014	2.46	397.94
1/31/2014	2.88	398.36
2/1/2014	3.07	398.55
2/2/2014	2.68	398.16
2/3/2014	2.40	397.88
2/4/2014	2.09	397.57
2/5/2014	2.08	397.56
2/6/2014	2.20	397.68
2/7/2014	2.42	397.90
2/8/2014	2.52	398.00
2/9/2014	2.60	398.08
2/10/2014	2.88	398.36
2/11/2014	2.33	397.81
2/12/2014	1.99	397.47
2/13/2014	1.96	397.44
2/14/2014	1.93	397.41
2/15/2014	2.34	397.82
2/16/2014	2.14	397.62
2/17/2014	2.35	397.83
2/18/2014	2.16	397.64
2/19/2014	2.13	397.61
2/20/2014	3.57	399.05
2/21/2014	7.20	402.68
2/22/2014	10.83	406.31
2/23/2014	11.81	407.29
2/24/2014	12.06	407.54
2/25/2014	9.76	405.24
2/26/2014	8.67	404.15
2/27/2014	8.18	403.66
2/28/2014	6.80	402.28
3/1/2014	7.10	402.58
3/2/2014	6.69	402.17
3/3/2014	4.50	399.98
3/4/2014	5.24	400.72
3/5/2014	5.69	401.17
3/6/2014	5.93	401.41

Date	River Stage (ft)	River Elevation (ft-amsl)
3/7/2014	5.48	400.96
3/8/2014	5.15	400.63
3/9/2014	4.41	399.89
3/10/2014	4.42	399.90
3/11/2014	4.55	400.03
3/12/2014	7.66	403.14
3/13/2014	7.84	403.32
3/14/2014	9.98	405.46
3/15/2014	10.03	405.51
3/16/2014	9.57	405.05
3/17/2014	9.78	405.26
3/18/2014	9.32	404.80
3/19/2014	9.85	405.33
3/20/2014	9.96	405.44
3/21/2014	9.56	405.04
3/22/2014	9.75	405.23
3/23/2014	9.29	404.77
3/24/2014	9.03	404.51
3/25/2014	9.40	404.88
3/26/2014	9.26	404.74
3/27/2014	8.93	404.41
3/28/2014	8.81	404.29
3/29/2014	8.88	404.36
3/30/2014	8.36	403.84
3/31/2014	8.21	403.69
4/1/2014	8.41	403.89
4/2/2014	8.30	403.78
4/3/2014	10.01	405.49
4/4/2014	15.89	411.37
4/5/2014	18.30	413.78
4/6/2014	15.28	410.76
4/7/2014	13.27	408.75
4/8/2014	12.08	407.56
4/9/2014	10.90	406.38
4/10/2014	11.22	406.70
4/11/2014	10.70	406.18
4/12/2014	9.85	405.33
4/13/2014	9.94	405.42
4/14/2014	9.32	404.80
4/15/2014	9.34	404.82
4/16/2014	9.48	404.96

Date	River Stage (ft)	River Elevation (ft-amsl)
4/17/2014	10.77	406.25
4/18/2014	11.61	407.09
4/19/2014	12.06	407.54
4/20/2014	12.01	407.49
4/21/2014	12.25	407.73
4/22/2014	12.18	407.66
4/23/2014	12.15	407.63
4/24/2014	12.25	407.73
4/25/2014	12.34	407.82
4/26/2014	12.37	407.85
4/27/2014	12.22	407.70
4/28/2014	12.53	408.01
4/29/2014	13.67	409.15
4/30/2014	14.26	409.74
5/1/2014	14.11	409.59
5/2/2014	14.20	409.68
5/3/2014	14.05	409.53
5/4/2014	13.73	409.21
5/5/2014	13.42	408.90
5/6/2014	13.10	408.58
5/7/2014	12.88	408.36
5/8/2014	12.81	408.29
5/9/2014	12.80	408.28
5/10/2014	12.75	408.23
5/11/2014	13.02	408.50
5/12/2014	13.62	409.10
5/13/2014	14.22	409.70
5/14/2014	14.13	409.61
5/15/2014	14.60	410.08
5/16/2014	14.92	410.40
5/17/2014	15.49	410.97
5/18/2014	16.24	411.72
5/19/2014	16.32	411.80
5/20/2014	15.98	411.46
5/21/2014	15.58	411.06
5/22/2014	15.26	410.74
5/23/2014	15.06	410.54
5/24/2014	14.78	410.26
5/25/2014	14.64	410.12
5/26/2014	14.61	410.09
5/27/2014	14.52	410.00

Date	River Stage (ft)	River Elevation (ft-amsl)
5/28/2014	14.45	409.93
5/29/2014	14.43	409.91
5/30/2014	14.03	409.51
5/31/2014	13.81	409.29
6/1/2014	13.46	408.94
6/2/2014	13.12	408.60
6/3/2014	12.84	408.32
6/4/2014	12.57	408.05
6/5/2014	13.29	408.77
6/6/2014	13.98	409.46
6/7/2014	14.71	410.19
6/8/2014	17.01	412.49
6/9/2014	17.32	412.80
6/10/2014	17.86	413.34
6/11/2014	19.49	414.97
6/12/2014	19.86	415.34
6/13/2014	19.03	414.51
6/14/2014	17.93	413.41
6/15/2014	16.87	412.35
6/16/2014	15.60	411.08
6/17/2014	14.34	409.82
6/18/2014	13.75	409.23
6/19/2014	14.17	409.65
6/20/2014	13.85	409.33
6/21/2014	13.99	409.47
6/22/2014	14.92	410.40
6/23/2014	15.48	410.96
6/24/2014	16.59	412.07
6/25/2014	17.68	413.16
6/26/2014	18.31	413.79
6/27/2014	18.77	414.25
6/28/2014	19.06	414.54
6/29/2014	19.33	414.81
6/30/2014	19.52	415.00
7/1/2014	19.59	415.07
7/2/2014	19.87	415.35
7/3/2014	20.24	415.72
7/4/2014	20.54	416.02
7/5/2014	20.71	416.19
7/6/2014	21.21	416.69
7/7/2014	22.01	417.49

Date	River Stage (ft)	River Elevation (ft-amsl)
7/8/2014	22.86	418.34
7/9/2014	23.70	419.18
7/10/2014	25.04	420.52
7/11/2014	25.83	421.31
7/12/2014	25.47	420.95
7/13/2014	24.76	420.24
7/14/2014	24.22	419.70
7/15/2014	23.35	418.83
7/16/2014	22.90	418.38
7/17/2014	22.56	418.04
7/18/2014	21.31	416.79
7/19/2014	20.50	415.98
7/20/2014	19.50	414.98
7/21/2014	18.36	413.84
7/22/2014	17.14	412.62
7/23/2014	15.88	411.36
7/24/2014	14.87	410.35
7/25/2014	14.22	409.70
7/26/2014	13.40	408.88
7/27/2014	12.73	408.21
7/28/2014	12.64	408.12
7/29/2014	11.70	407.18
7/30/2014	9.32	404.80
7/31/2014	8.10	403.58
8/1/2014	8.06	403.54
8/2/2014	7.58	403.06
8/3/2014	7.17	402.65
8/4/2014	6.54	402.02
8/5/2014	6.51	401.99
8/6/2014	6.30	401.78
8/7/2014	6.07	401.55
8/8/2014	9.04	404.52
8/9/2014	7.71	403.19
8/10/2014	7.25	402.73
8/11/2014	6.87	402.35
8/12/2014	6.28	401.76
8/13/2014	6.39	401.87
8/14/2014	5.33	400.81
8/15/2014	5.85	401.33
8/16/2014	5.43	400.91
8/17/2014	7.46	402.94

Date	River Stage (ft)	River Elevation (ft-amsl)
8/18/2014	8.48	403.96
8/19/2014	5.82	401.30
8/20/2014	6.72	402.20
8/21/2014	6.81	402.29
8/22/2014	7.00	402.48
8/23/2014	6.33	401.81
8/24/2014	6.60	402.08
8/25/2014	6.66	402.14
8/26/2014	8.41	403.89
8/27/2014	7.30	402.78
8/28/2014	7.19	402.67
8/29/2014	7.34	402.82
8/30/2014	7.86	403.34
8/31/2014	7.83	403.31
9/1/2014	7.74	403.22
9/2/2014	9.94	405.42
9/3/2014	12.34	407.82
9/4/2014	11.50	406.98
9/5/2014	9.59	405.07
9/6/2014	9.44	404.92
9/7/2014	10.14	405.62
9/8/2014	9.57	405.05
9/9/2014	8.87	404.35
9/10/2014	11.69	407.17
9/11/2014	14.74	410.22
9/12/2014	16.12	411.60
9/13/2014	18.56	414.04
9/14/2014	20.48	415.96
9/15/2014	20.98	416.46
9/16/2014	20.01	415.49
9/17/2014	18.99	414.47
9/18/2014	18.16	413.64
9/19/2014	17.02	412.50
9/20/2014	15.50	410.98
9/21/2014	14.28	409.76
9/22/2014	13.25	408.73
9/23/2014	12.72	408.20
9/24/2014	12.13	407.61
9/25/2014	11.50	406.98
9/26/2014	11.01	406.49
9/27/2014	9.53	405.01

Date	River Stage (ft)	River Elevation (ft-amsl)
9/28/2014	8.20	403.68
9/29/2014	8.04	403.52
9/30/2014	7.27	402.75
10/1/2014	7.31	402.79
10/2/2014	10.52	406.00
10/3/2014	13.29	408.77
10/4/2014	17.22	412.70
10/5/2014	17.59	413.07
10/6/2014	15.31	410.79
10/7/2014	13.31	408.79
10/8/2014	11.42	406.90
10/9/2014	10.83	406.31
10/10/2014	10.88	406.36
10/11/2014	11.32	406.80
10/12/2014	11.75	407.23
10/13/2014	11.79	407.27
10/14/2014	12.91	408.39
10/15/2014	14.77	410.25
10/16/2014	16.58	412.06
10/17/2014	18.34	413.82
10/18/2014	17.71	413.19
10/19/2014	14.85	410.33
10/20/2014	13.25	408.73
10/21/2014	12.49	407.97
10/22/2014	11.82	407.30
10/23/2014	11.74	407.22
10/24/2014	11.09	406.57
10/25/2014	10.93	406.41
10/26/2014	10.61	406.09
10/27/2014	9.99	405.47
10/28/2014	10.02	405.50
10/29/2014	8.35	403.83
10/30/2014	8.32	403.80
10/31/2014	8.30	403.78
11/1/2014	8.08	403.56
11/2/2014	7.84	403.32
11/3/2014	7.20	402.68
11/4/2014	6.68	402.16
11/5/2014	6.60	402.08
11/6/2014	6.84	402.32
11/7/2014	6.35	401.83

Date	River Stage (ft)	River Elevation (ft-amsl)
11/8/2014	6.40	401.88
11/9/2014	6.41	401.89
11/10/2014	5.94	401.42
11/11/2014	6.01	401.49
11/12/2014	5.99	401.47
11/13/2014	5.86	401.34
11/14/2014	5.88	401.36
11/15/2014	6.10	401.58
11/16/2014	6.32	401.80
11/17/2014	5.96	401.44
11/18/2014	5.65	401.13
11/19/2014	5.93	401.41
11/20/2014	4.73	400.21
11/21/2014	4.19	399.67
11/22/2014	3.69	399.17
11/23/2014	3.35	398.83
11/24/2014	5.80	401.28
11/25/2014	6.84	402.32
11/26/2014	5.97	401.45
11/27/2014	6.72	402.20
11/28/2014	6.86	402.34
11/29/2014	6.57	402.05
11/30/2014	6.48	401.96
12/1/2014	6.82	402.30
12/2/2014	6.83	402.31
12/3/2014	6.73	402.21
12/4/2014	6.45	401.93
12/5/2014	6.08	401.56
12/6/2014	6.40	401.88
12/7/2014	6.98	402.46
12/8/2014	7.01	402.49
12/9/2014	6.73	402.21
12/10/2014	6.31	401.79
12/11/2014	6.51	401.99
12/12/2014	6.91	402.39
12/13/2014	6.85	402.33
12/14/2014	6.55	402.03
12/15/2014	5.91	401.39
12/16/2014	6.40	401.88
12/17/2014	6.06	401.54
12/18/2014	5.77	401.25

Date	River Stage (ft)	River Elevation (ft-amsl)
12/19/2014	5.60	401.08
12/20/2014	6.04	401.52
12/21/2014	6.15	401.63
12/22/2014	5.99	401.47
12/23/2014	6.09	401.57
12/24/2014	6.63	402.11
12/25/2014	7.49	402.97
12/26/2014	7.20	402.68
12/27/2014	7.51	402.99
12/28/2014	7.72	403.20
12/29/2014	7.16	402.64
12/30/2014	7.20	402.68
12/31/2014	6.62	402.10
1/1/2015	5.94	401.42
1/2/2015	4.07	399.55
1/3/2015	3.85	399.33
1/4/2015	4.95	400.43
1/5/2015	5.44	400.92
1/6/2015	4.01	399.49
1/7/2015	3.76	399.24
1/8/2015	3.18	398.66
1/9/2015	3.06	398.54
1/10/2015	3.35	398.83
1/11/2015	3.61	399.09
1/12/2015	4.42	399.90
1/13/2015	4.26	399.74
1/14/2015	4.01	399.49
1/15/2015	4.03	399.51
1/16/2015	4.34	399.82
1/17/2015	4.41	399.89
1/18/2015	4.32	399.80
1/19/2015	4.44	399.92
1/20/2015	4.42	399.90
1/21/2015	4.45	399.93
1/22/2015	4.80	400.28
1/23/2015	5.03	400.51
1/24/2015	4.81	400.29
1/25/2015	4.71	400.19
1/26/2015	5.03	400.51
1/27/2015	5.09	400.57
1/28/2015	5.06	400.54

Date	River Stage (ft)	River Elevation (ft-amsl)
1/29/2015	5.76	401.24
1/30/2015	5.18	400.66
1/31/2015	5.15	400.63
2/1/2015	5.03	400.51
2/2/2015	5.24	400.72
2/3/2015	4.82	400.30
2/4/2015	5.12	400.60
2/5/2015	5.67	401.15
2/6/2015	5.36	400.84
2/7/2015	5.67	401.15
2/8/2015	5.25	400.73
2/9/2015	5.57	401.05
2/10/2015	5.89	401.37
2/11/2015	5.82	401.30
2/12/2015	6.27	401.75
2/13/2015	5.78	401.26
2/14/2015	5.93	401.41
2/15/2015	5.68	401.16
2/16/2015	4.98	400.46
2/17/2015	4.49	399.97
2/18/2015	4.80	400.28
2/19/2015	4.18	399.66
2/20/2015	4.81	400.29
2/21/2015	4.83	400.31
2/22/2015	4.97	400.45
2/23/2015	3.88	399.36
2/24/2015	3.88	399.36
2/25/2015	3.92	399.40
2/26/2015	4.22	399.70
2/27/2015	3.31	398.79
2/28/2015	3.59	399.07
3/1/2015	3.78	399.26
3/2/2015	3.98	399.46
3/3/2015	4.04	399.52
3/4/2015	3.82	399.30
3/5/2015	3.40	398.88
3/6/2015	3.48	398.96
3/7/2015	3.75	399.23
3/8/2015	3.67	399.15
3/9/2015	4.69	400.17
3/10/2015	5.44	400.92

Date	River Stage (ft)	River Elevation (ft-amsl)
3/11/2015	6.47	401.95
3/12/2015	6.90	402.38
3/13/2015	7.04	402.52
3/14/2015	8.77	404.25
3/15/2015	8.74	404.22
3/16/2015	8.91	404.39
3/17/2015	9.10	404.58
3/18/2015	9.73	405.21
3/19/2015	9.99	405.47
3/20/2015	10.05	405.53
3/21/2015	9.65	405.13
3/22/2015	8.29	403.77
3/23/2015	7.87	403.35
3/24/2015	7.75	403.23
3/25/2015	8.33	403.81
3/26/2015	8.86	404.34
3/27/2015	8.86	404.34
3/28/2015	9.00	404.48
3/29/2015	8.53	404.01
3/30/2015	8.37	403.85
3/31/2015	7.82	403.30
4/1/2015	7.36	402.84
4/2/2015	7.22	402.70
4/3/2015	7.76	403.24
4/4/2015	7.60	403.08
4/5/2015	7.99	403.47
4/6/2015	7.25	402.73
4/7/2015	7.29	402.77
4/8/2015	8.48	403.96
4/9/2015	9.16	404.64
4/10/2015	11.21	406.69
4/11/2015	9.28	404.76
4/12/2015	8.35	403.83
4/13/2015	8.64	404.12
4/14/2015	8.96	404.44
4/15/2015	8.89	404.37
4/16/2015	8.98	404.46
4/17/2015	10.54	406.02
4/18/2015	10.36	405.84
4/19/2015	9.99	405.47
4/20/2015	9.90	405.38

Date	River Stage (ft)	River Elevation (ft-amsl)
4/21/2015	9.77	405.25
4/22/2015	9.82	405.30
4/23/2015	9.53	405.01
4/24/2015	9.82	405.30
4/25/2015	9.78	405.26
4/26/2015	9.67	405.15
4/27/2015	9.22	404.70
4/28/2015	9.20	404.68
4/29/2015	9.68	405.16
4/30/2015	9.61	405.09
5/1/2015	9.34	404.82
5/2/2015	8.73	404.21
5/3/2015	7.93	403.41
5/4/2015	7.12	402.60
5/5/2015	6.49	401.97
5/6/2015	7.32	402.80
5/7/2015	7.74	403.22
5/8/2015	7.70	403.18
5/9/2015	9.26	404.74
5/10/2015	10.07	405.55
5/11/2015	9.93	405.41
5/12/2015	10.41	405.89
5/13/2015	10.82	406.30
5/14/2015	10.19	405.67
5/15/2015	10.37	405.85
5/16/2015	10.58	406.06
5/17/2015	11.32	406.80
5/18/2015	11.29	406.77
5/19/2015	12.40	407.88
5/20/2015	14.56	410.04
5/21/2015	15.27	410.75
5/22/2015	14.97	410.45
5/23/2015	14.50	409.98
5/24/2015	13.58	409.06
5/25/2015	13.06	408.54
5/26/2015	14.21	409.69
5/27/2015	15.84	411.32
5/28/2015	16.89	412.37
5/29/2015	17.10	412.58
5/30/2015	18.24	413.72
5/31/2015	19.74	415.22

Date	River Stage (ft)	River Elevation (ft-amsl)
6/1/2015	19.79	415.27
6/2/2015	18.61	414.09
6/3/2015	17.68	413.16
6/4/2015	16.86	412.34
6/5/2015	16.53	412.01
6/6/2015	17.21	412.69
6/7/2015	19.04	414.52
6/8/2015	20.33	415.81
6/9/2015	21.90	417.38
6/10/2015	23.13	418.61
6/11/2015	22.75	418.23
6/12/2015	21.03	416.51
6/13/2015	19.30	414.78
6/14/2015	19.18	414.66
6/15/2015	21.61	417.09
6/16/2015	23.59	419.07
6/17/2015	25.27	420.75
6/18/2015	26.46	421.94
6/19/2015	27.94	423.42
6/20/2015	29.68	425.16
6/21/2015	30.23	425.71
6/22/2015	30.04	425.52
6/23/2015	30.03	425.51
6/24/2015	30.23	425.71
6/25/2015	29.87	425.35
6/26/2015	29.73	425.21
6/27/2015	29.88	425.36
6/28/2015	30.88	426.36
6/29/2015	31.65	427.13
6/30/2015	32.17	427.65
7/1/2015	32.15	427.63
7/2/2015	31.35	426.83
7/3/2015	30.76	426.24
7/4/2015	30.40	425.88
7/5/2015	29.67	425.15
7/6/2015	28.40	423.88
7/7/2015	26.57	422.05
7/8/2015	24.85	420.33
7/9/2015	24.65	420.13
7/10/2015	27.08	422.56
7/11/2015	28.70	424.18

Date	River Stage (ft)	River Elevation (ft-amsl)
7/12/2015	28.34	423.82
7/13/2015	27.08	422.56
7/14/2015	27.07	422.55
7/15/2015	27.46	422.94
7/16/2015	27.13	422.61
7/17/2015	25.32	420.80
7/18/2015	23.28	418.76
7/19/2015	22.48	417.96
7/20/2015	23.44	418.92
7/21/2015	25.09	420.57
7/22/2015	25.64	421.12
7/23/2015	25.55	421.03
7/24/2015	24.45	419.93
7/25/2015	22.64	418.12
7/26/2015	20.46	415.94
7/27/2015	19.67	415.15
7/28/2015	20.13	415.61
7/29/2015	20.27	415.75
7/30/2015	20.32	415.80
7/31/2015	20.23	415.71
8/1/2015	19.53	415.01
8/2/2015	18.70	414.18
8/3/2015	17.59	413.07
8/4/2015	16.83	412.31
8/5/2015	15.99	411.47
8/6/2015	15.52	411.00
8/7/2015	14.46	409.94
8/8/2015	13.11	408.59
8/9/2015	11.72	407.20
8/10/2015	11.34	406.82
8/11/2015	10.84	406.32
8/12/2015	11.18	406.66
8/13/2015	11.86	407.34
8/14/2015	12.63	408.11
8/15/2015	11.77	407.25
8/16/2015	10.28	405.76
8/17/2015	9.20	404.68
8/18/2015	7.61	403.09
8/19/2015	8.96	404.44
8/20/2015	8.64	404.12
8/21/2015	8.23	403.71

Date	River Stage (ft)	River Elevation (ft-amsl)
8/22/2015	8.09	403.57
8/23/2015	9.02	404.50
8/24/2015	9.04	404.52
8/25/2015	9.09	404.57
8/26/2015	8.69	404.17
8/27/2015	8.26	403.74
8/28/2015	7.91	403.39
8/29/2015	7.38	402.86
8/30/2015	7.49	402.97
8/31/2015	7.33	402.81
9/1/2015	7.29	402.77
9/2/2015	7.05	402.53
9/3/2015	7.07	402.55
9/4/2015	7.91	403.39
9/5/2015	7.81	403.29
9/6/2015	7.55	403.03
9/7/2015	7.48	402.96
9/8/2015	7.17	402.65
9/9/2015	7.15	402.63
9/10/2015	7.05	402.53
9/11/2015	7.59	403.07
9/12/2015	8.45	403.93
9/13/2015	9.18	404.66
9/14/2015	9.16	404.64
9/15/2015	8.68	404.16
9/16/2015	8.07	403.55
9/17/2015	8.34	403.82
9/18/2015	7.98	403.46
9/19/2015	7.69	403.17
9/20/2015	8.19	403.67
9/21/2015	9.15	404.63
9/22/2015	9.48	404.96
9/23/2015	8.56	404.04
9/24/2015	8.08	403.56
9/25/2015	7.58	403.06
9/26/2015	7.63	403.11
9/27/2015	7.07	402.55
9/28/2015	6.39	401.87
9/29/2015	6.22	401.70
9/30/2015	7.13	402.61
10/1/2015	7.51	402.99

Date	River Stage (ft)	River Elevation (ft-amsl)
10/2/2015	6.82	402.30
10/3/2015	6.54	402.02
10/4/2015	6.08	401.56
10/5/2015	5.77	401.25
10/6/2015	5.88	401.36
10/7/2015	5.53	401.01
10/8/2015	5.41	400.89
10/9/2015	4.84	400.32
10/10/2015	4.59	400.07
10/11/2015	4.18	399.66
10/12/2015	4.25	399.73
10/13/2015	4.50	399.98
10/14/2015	4.63	400.11
10/15/2015	4.40	399.88
10/16/2015	4.31	399.79
10/17/2015	3.94	399.42
10/18/2015	3.53	399.01
10/19/2015	3.79	399.27
10/20/2015	4.01	399.49
10/21/2015	3.98	399.46
10/22/2015	3.68	399.16
10/23/2015	4.21	399.69
10/24/2015	4.06	399.54
10/25/2015	3.79	399.27
10/26/2015	3.69	399.17
10/27/2015	3.61	399.09
10/28/2015	4.22	399.70
10/29/2015	4.63	400.11
10/30/2015	4.53	400.01
10/31/2015	4.97	400.45
11/1/2015	5.56	401.04
11/2/2015	5.80	401.28
11/3/2015	5.90	401.38
11/4/2015	6.28	401.76
11/5/2015	6.84	402.32
11/6/2015	6.97	402.45
11/7/2015	6.57	402.05
11/8/2015	6.45	401.93
11/9/2015	6.39	401.87
11/10/2015	6.04	401.52
11/11/2015	6.24	401.72

Date	River Stage (ft)	River Elevation (ft-amsl)
11/12/2015	6.80	402.28
11/13/2015	5.70	401.18
11/14/2015	5.47	400.95
11/15/2015	5.77	401.25
11/16/2015	5.68	401.16
11/17/2015	6.60	402.08
11/18/2015	10.00	405.48
11/19/2015	13.71	409.19
11/20/2015	13.41	408.89
11/21/2015	13.23	408.71
11/22/2015	12.83	408.31
11/23/2015	11.91	407.39
11/24/2015	11.35	406.83
11/25/2015	11.24	406.72
11/26/2015	11.08	406.56
11/27/2015	11.20	406.68
11/28/2015	13.49	408.97
11/29/2015	17.33	412.81
11/30/2015	19.55	415.03
12/1/2015	19.95	415.43
12/2/2015	20.26	415.74
12/3/2015	20.42	415.90
12/4/2015	20.13	415.61
12/5/2015	19.52	415.00
12/6/2015	18.37	413.85
12/7/2015	16.65	412.13
12/8/2015	15.09	410.57
12/9/2015	14.52	410.00
12/10/2015	13.68	409.16
12/11/2015	12.97	408.45
12/12/2015	12.46	407.94
12/13/2015	12.03	407.51
12/14/2015	12.30	407.78
12/15/2015	16.17	411.65
12/16/2015	19.73	415.21
12/17/2015	22.30	417.78
12/18/2015	23.64	419.12
12/19/2015	23.97	419.45
12/20/2015	23.85	419.33
12/21/2015	23.11	418.59
12/22/2015	21.82	417.30

Date	River Stage (ft)	River Elevation (ft-amsl)
12/23/2015	20.99	416.47
12/24/2015	21.26	416.74
12/25/2015	21.20	416.68
12/26/2015	21.21	416.69
12/27/2015	25.81	421.29
12/28/2015	29.69	425.17
12/29/2015	33.60	429.08
12/30/2015	35.09	430.57
12/31/2015	35.54	431.02
1/1/2016	35.76	431.24
1/2/2016	34.49	429.97
1/3/2016	31.85	427.33
1/4/2016	28.82	424.30
1/5/2016	26.45	421.93
1/6/2016	24.29	419.77
1/7/2016	22.68	418.16
1/8/2016	21.52	417.00
1/9/2016	20.68	416.16
1/10/2016	21.10	416.58
1/11/2016	22.11	417.59
1/12/2016	22.28	417.76
1/13/2016	21.43	416.91
1/14/2016	19.72	415.20
1/15/2016	17.39	412.87
1/16/2016	16.97	412.45
1/17/2016	16.27	411.75
1/18/2016	15.14	410.62
1/19/2016	12.71	408.19
1/20/2016	11.65	407.13
1/21/2016	14.00	409.48
1/22/2016	13.38	408.86
1/23/2016	12.16	407.64
1/24/2016	11.60	407.08
1/25/2016	11.02	406.50
1/26/2016	11.54	407.02
1/27/2016	11.48	406.96
1/28/2016	11.39	406.87
1/29/2016	11.40	406.88
1/30/2016	11.06	406.54
1/31/2016	10.78	406.26
2/1/2016	10.76	406.24

Date	River Stage (ft)	River Elevation (ft-amsl)
2/2/2016	10.47	405.95
2/3/2016	10.88	406.36
2/4/2016	11.73	407.21
2/5/2016	12.42	407.90
2/6/2016	12.69	408.17
2/7/2016	12.29	407.77
2/8/2016	11.45	406.93
2/9/2016	10.23	405.71
2/10/2016	9.76	405.24
2/11/2016	7.78	403.26
2/12/2016	9.11	404.59
2/13/2016	8.17	403.65
2/14/2016	7.16	402.64
2/15/2016	7.48	402.96
2/16/2016	7.07	402.55
2/17/2016	6.98	402.46
2/18/2016	7.45	402.93
2/19/2016	8.55	404.03
2/20/2016	8.56	404.04
2/21/2016	9.68	405.16
2/22/2016	9.16	404.64
2/23/2016	9.68	405.16
2/24/2016	11.18	406.66
2/25/2016	11.63	407.11
2/26/2016	12.26	407.74
2/27/2016	11.90	407.38
2/28/2016	11.82	407.30
2/29/2016	11.10	406.58
3/1/2016	10.61	406.09
3/2/2016	10.75	406.23
3/3/2016	11.12	406.60
3/4/2016	10.93	406.41
3/5/2016	10.72	406.20
3/6/2016	10.24	405.72
3/7/2016	10.25	405.73
3/8/2016	10.26	405.74
3/9/2016	9.88	405.36
3/10/2016	10.23	405.71
3/11/2016	9.90	405.38
3/12/2016	9.56	405.04
3/13/2016	9.56	405.04

Date	River Stage (ft)	River Elevation (ft-amsl)
3/14/2016	9.76	405.24
3/15/2016	10.02	405.50
3/16/2016	10.46	405.94
3/17/2016	10.60	406.08
3/18/2016	11.26	406.74
3/19/2016	12.00	407.48
3/20/2016	12.52	408.00
3/21/2016	12.94	408.42
3/22/2016	12.83	408.31
3/23/2016	12.66	408.14
3/24/2016	12.49	407.97
3/25/2016	12.30	407.78
3/26/2016	12.29	407.77
3/27/2016	12.35	407.83
3/28/2016	12.82	408.30
3/29/2016	13.44	408.92
3/30/2016	13.82	409.30
3/31/2016	14.76	410.24
4/1/2016	15.39	410.87
4/2/2016	15.46	410.94
4/3/2016	15.29	410.77
4/4/2016	15.04	410.52
4/5/2016	14.72	410.20
4/6/2016	14.31	409.79
4/7/2016	14.17	409.65
4/8/2016	13.96	409.44
4/9/2016	13.76	409.24
4/10/2016	13.82	409.30
4/11/2016	14.33	409.81
4/12/2016	14.48	409.96
4/13/2016	14.29	409.77
4/14/2016	14.10	409.58
4/15/2016	13.65	409.13
4/16/2016	13.17	408.65
4/17/2016	12.66	408.14
4/18/2016	11.85	407.33
4/19/2016	11.18	406.66
4/20/2016	10.87	406.35
4/21/2016	10.71	406.19
4/22/2016	10.39	405.87
4/23/2016	9.82	405.30

Date	River Stage (ft)	River Elevation (ft-amsl)
4/24/2016	9.19	404.67
4/25/2016	9.16	404.64
4/26/2016	10.02	405.50
4/27/2016	10.48	405.96
4/28/2016	10.71	406.19
4/29/2016	10.57	406.05
4/30/2016	14.00	409.48
5/1/2016	17.01	412.49
5/2/2016	16.35	411.83
5/3/2016	15.50	410.98
5/4/2016	16.36	411.84
5/5/2016	16.93	412.41
5/6/2016	16.90	412.38
5/7/2016	16.63	412.11
5/8/2016	16.10	411.58
5/9/2016	16.03	411.51
5/10/2016	16.33	411.81
5/11/2016	16.69	412.17
5/12/2016	17.60	413.08
5/13/2016	17.96	413.44
5/14/2016	18.02	413.50
5/15/2016	18.28	413.76
5/16/2016	17.89	413.37
5/17/2016	17.12	412.60
5/18/2016	16.77	412.25
5/19/2016	15.87	411.35
5/20/2016	14.67	410.15
5/21/2016	14.15	409.63
5/22/2016	13.72	409.20
5/23/2016	13.01	408.49
5/24/2016	12.55	408.03
5/25/2016	12.14	407.62
5/26/2016	12.26	407.74
5/27/2016	12.02	407.50
5/28/2016	13.65	409.13
5/29/2016	16.07	411.55
5/30/2016	17.34	412.82
5/31/2016	18.21	413.69
6/1/2016	18.30	413.78
6/2/2016	17.81	413.29
6/3/2016	17.01	412.49

Date	River Stage (ft)	River Elevation (ft-amsl)
6/4/2016	17.01	412.49
6/5/2016	15.21	410.69
6/6/2016	14.37	409.85
6/7/2016	14.03	409.51
6/8/2016	14.11	409.59
6/9/2016	14.01	409.49
6/10/2016	14.01	409.49
6/11/2016	13.02	408.50
6/12/2016	13.12	408.60
6/13/2016	12.87	408.35
6/14/2016	12.84	408.32
6/15/2016	12.96	408.44
6/16/2016	12.85	408.33
6/17/2016	13.01	408.49
6/18/2016	13.23	408.71
6/19/2016	13.96	409.44
6/20/2016	13.93	409.41
6/21/2016	13.69	409.17
6/22/2016	13.29	408.77
6/23/2016	13.16	408.64
6/24/2016	13.56	409.04
6/25/2016	14.46	409.94
6/26/2016	13.81	409.29
6/27/2016	12.96	408.44
6/28/2016	12.21	407.69
6/29/2016	11.44	406.92
6/30/2016	11.15	406.63
7/1/2016	10.88	406.36
7/2/2016	10.25	405.73
7/3/2016	9.82	405.30
7/4/2016	10.79	406.27
7/5/2016	13.36	408.84
7/6/2016	12.89	408.37
7/7/2016	12.37	407.85
7/8/2016	12.91	408.39
7/9/2016	13.22	408.70
7/10/2016	12.95	408.43
7/11/2016	11.49	406.97
7/12/2016	10.01	405.49
7/13/2016	9.21	404.69
7/14/2016	8.98	404.46

Date	River Stage (ft)	River Elevation (ft-amsl)
7/15/2016	10.12	405.60
7/16/2016	11.51	406.99
7/17/2016	10.80	406.28
7/18/2016	9.69	405.17
7/19/2016	8.76	404.24
7/20/2016	9.22	404.70
7/21/2016	10.43	405.91
7/22/2016	10.51	405.99
7/23/2016	12.06	407.54
7/24/2016	13.61	409.09
7/25/2016	14.27	409.75
7/26/2016	14.46	409.94
7/27/2016	13.65	409.13
7/28/2016	13.15	408.63
7/29/2016	13.06	408.54
7/30/2016	12.86	408.34
7/31/2016	12.56	408.04
8/1/2016	12.27	407.75
8/2/2016	12.22	407.70
8/3/2016	15.36	410.84
8/4/2016	16.52	412.00
8/5/2016	15.47	410.95
8/6/2016	15.11	410.59
8/7/2016	14.54	410.02
8/8/2016	13.62	409.10
8/9/2016	12.57	408.05
8/10/2016	11.05	406.53
8/11/2016	9.99	405.47
8/12/2016	9.45	404.93
8/13/2016	10.01	405.49
8/14/2016	10.67	406.15
8/15/2016	12.26	407.74
8/16/2016	12.01	407.49
8/17/2016	11.15	406.63
8/18/2016	10.68	406.16
8/19/2016	11.05	406.53
8/20/2016	10.54	406.02
8/21/2016	10.25	405.73
8/22/2016	9.98	405.46
8/23/2016	10.39	405.87
8/24/2016	10.55	406.03

<b>Date</b>	<b>River Stage (ft)</b>	<b>River Elevation (ft-amsl)</b>
8/25/2016	10.29	405.77
8/26/2016	10.48	405.96
8/27/2016	10.76	406.24
8/28/2016	12.34	407.82
8/29/2016	12.71	408.19
8/30/2016	14.69	410.17
8/31/2016	14.99	410.47
9/1/2016	14.49	409.97
9/2/2016	14.42	409.90
9/3/2016	14.87	410.35
9/4/2016	15.46	410.94
9/5/2016	15.04	410.52
9/6/2016	14.06	409.54
9/7/2016	13.04	408.52
9/8/2016	11.91	407.39
9/9/2016	11.56	407.04
9/10/2016	13.14	408.62
9/11/2016	17.23	412.71
9/12/2016	16.10	411.58
9/13/2016	14.27	409.75
9/14/2016	13.75	409.23
9/15/2016	13.28	408.76
9/16/2016	13.13	408.61
9/17/2016	16.32	411.80
9/18/2016	18.52	414.00
9/19/2016	16.74	412.22
9/20/2016	15.74	411.22
9/21/2016	15.21	410.69
9/22/2016	16.05	411.53